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OPERATIONAL REPORT ON A
SIROTEM TRANSIENT EM SURVEY
AT QUEENSTOWN, TASMANIA
FOR
MT. LYELL MINING AND RAILWAY
COMPANY LIMITED

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NB ONLY FIGS' 9-11 & 36.
NOT ON MICROFICHE

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1. INTRODUCTION

Between 28th January and 9th April, 1982, and on 8th May, 1982, a SIROTEM Transient EM survey was carried out in the Queenstown area for Mt. Lyell Mining and Railway Company Limited. The Party chief was David Pickering.

2. SURVEY EQUIPMENT

- 1 MKII SIROTEM unit with ancilliary cables.
- 1 RVR-1 Roving Vector Receiver with 500m of connecting cable.
- 1 25mm downhole probe with 500m of 4 conductor armoured cable and hand-powered NUHEC winch.

3. SURVEY DETAILS

Survey work was done on three grids, all located in the general Queenstown area. These were the Red Hills grid; the Dora-Spicer grid; and the Mine Lease, where various types of survey were done. A summary of all the work is given in Table 1.

The survey commenced with work on the Red Hills grid, for which the survey crew stayed at the Henty Camp which was reasonably local to the survey area. Drillhole RH5 was first logged with the transmitter loop laid out on surface and being a 200 metre square loop. Prior to putting the probe down the drillhole, a measurement was taken firstly in coincident loop mode on the transmitter loop itself and then using the probe as a receiver located vertically in the centre of the transmitter loop. The polarity was adjusted by ensuring that both the coincident loop measurement and the probe measurement had the same polarity. The probe was then lowered to the bottom of the

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TABLE 1

TRAVERSE DETAILS

LINE	RANGE	Tx LOOP NO.	COMPONENTS	NO. OF STATIONS	FIGURE NUMBERS
RED HILLS AREA					
Fixed Transmitter - Roving Receiver Configuration					
4S ✓	200E - 640E	1	V & EW	23	4 & 5
6S ✓	260E - 620E	1	V & EW	19	6 & 7
8S ✓	240E - 620E	1	V & EW	18	8 & 9
10S ✓	120E - 620E	1	V & EW	26	10 & 11
12S ✓	200E - 580E	1	V & EW	20	12 & 13
14S ✓	200E - 580E	1	V & EW	20	14 & 15
16S ✓	200E - 700E	2	V & EW	26	16 & 17
18S ✓	200E - 640E	2	V & EW	23	18 & 19
20S ✓	200E - 680E	2	V & EW	25	20 & 21
22S ✓	260E - 660E	4	V & EW	21	22 & 23
24S ✓	240E - 680E	4	V & EW	23	24 & 25
26S ✓	260E - 680E	4	V & EW	22	26 & 27
28S ✓	260E - 660E	4	V & EW	21	28 & 29
29S ✓	260E - 680E	4	V & EW	22	30 & 31
30S ✓	420E - 780E	3	V	19	32
32S ✓	460E - 920E	3	V	24	33
34S ✓	700E - 960E	3	V	14	34
36S ✓	560E - 900E	3	V	18	35
38S ✓	560E - 900E	3	V	18	36
40S ✓	600E - 900E	3	V	16	37
DDH RH-5 ✓	60 - 200m	-	-	18	38
DORA-SPICER AREA					
136S ✓	1860E - 2020E	2	V & EW	9	39, 40
140S ✓	1900E - 2080E	2	V & EW	10	41, 42
144S ✓	1920E - 2200E	2	V & EW	15	43, 44
152S ✓	1920E - 2200E	2	V & EW	15	45, 46
168S ✓	2000E - 2400E	1	V & EW	21	47, 48
176S ✓	2100E - 2400E	1	V & EW	16	49, 50
184S ✓	2100E - 2400E	1	V & EW	16	51, 52
MINE LEASE ANACONDA GRID					
25W	2600N - 3200N	1	V & NS	7	53, 54
26W	2600N - 3100N	1	V & NS	6	55, 56
27W	2600N - 3100N	1	V & NS	6	57, 58
28W	2450N - 3600N	1	V, NS & EW	19	59, 60, 61
25W	2600N - 3650N	2	V & NS	22	62, 63
26W	1150N - 3650N	2	V, NS & EW	51	64, 65, 66
27W	2600N - 3650N	2	V & NS	22	67, 68
28W	2600N - 3500N	2	V & NS	19	69, 70
29W	2600N - 3400N	2	V & NS	17	71, 72
30W	2600N - 3250N	2	V, NS & EW	14	73, 74, 75
31W	2200N - 3300N	2	V, NS & EW	22	76, 77, 78

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LINE	RANGE	Tx LOOP NO.	COMPONENTS	NO. OF STATIONS	FIGURE NUMBERS
WEST THARSIS TEST					
28W	850N - 2000N	1	V, NS & EW	24	79, 80, 81
24W	850N - 2000N	1	V, NS & EW	24	82, 83, 84
28W	850N - 2000N	2	V, NS & EW	24	85, 86, 87
24W	850N - 2000N	2	V, NS & EW	24	88, 89, 90
24W	1000N - 2000N	200 ft. Coincident Loop		11	91

GORMANSTON

LINE	RANGE	CONFIGURATION	LOOP SIZE	NO. OF STATIONS	FIGURE NUMBERS
40650N	3100E - 3750E	Coincident	100m	14	92
40650N	3100E - 3750E	In-Loop	100m	14	93
DDH WL-533	10 - 360m	Drillhole	200m	71	94

hole, that is 200 metres, and readings were taken every 1 or 2 metres at the bottom of the hole expanding to much wider spacings further up the hole, because the main area of interest was in the last 20 or 30 metres of the hole. The remainder of the surveying at Red Hills was done using a fixed transmitter/roving receiver configuration. The locations of the four transmitter loops used are given in Figure 1, together with the lines surveyed from each loop. The procedure comprised setting up the instrument on the transmitter loop and laying out two conductor cable to link the SIROTEM unit to the station at which the measurement was required. Readings were generally taken at 20 metre intervals. The initial reading was for the vertical component with the plane of the receiver horizontal. The component parallel to the survey line was then measured by setting the receiver coil on its edge with the plane of the receiver perpendicular to the survey line. These two components were measured for most of the survey lines with the exception of lines 30S to 40S for which only the vertical component was measured. The initial survey plan was to use only transmitter loops 1, 2 and 3 for surveying this area. However, after the initial work had been done it was found that certain of the data were not responsive to variations of location or orientation and were therefore concluded to be defective. These lines were subsequently re-surveyed at Geox's expense using transmitter loop 4.

The survey on the Dora-Spicer area all comprised fixed transmitter/roving receiver configuration work as described in the above paragraph. Two transmitter loops were used as shown in Figure 2 and two field components, vertical and parallel to the survey line, were measured at each station. The same data problem as for Red Hills was encountered on two lines for the Dora-Spicer area and these lines were subsequently re-surveyed.

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Work on the Mine Lease covered essentially two grids, the Anaconda Grid and the Gormanston Grid, and again comprised mostly fixed transmitter/roving receiver configuration work. The transmitter loops are shown in Figure 3. The Anaconda Grid was surveyed initially using transmitter loop 1, which was located directly over the zone of interest with readings being taken primarily inside the transmitter loop. However, it was subsequently decided that more effective data might be gained by offsetting the loop to one side of the area of interest, so that these lines were re-surveyed with transmitter loop 2. The vertical component and the component parallel to the survey line was surveyed for every station with the component perpendicular to the survey line being surveyed for some selected lines.

The West Tharsis work was done to check the response of the system to known sulphide mineralisation. This work was done at Geocox's expense in the interest of gaining a satisfactory case history for the method. Two transmitter loops were used as shown in Figure 3, the first being set-up to be offset from the conductor and the second to locate one wire of the transmitter loop directly over the conductor and therefore give maximum coupling. All three components of the secondary field were measured at each station. Additionally, line 24W was covered using a 200 foot square coincident loop configuration to yield a comparison of the response with two fairly commonly used TEM loop configurations.

It should be noted that all work on the Mine Lease was located virtually over an operating mine and therefore noise levels were quite high. Additionally, much of the surveying was done over areas of dump material with the possibility of isolated boulders of virtually massive pyrite being present at scattered locations. These would be expected to generate some local spacial varying noise.

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The work at Gormanston comprised coverage of one line using the coincident loop configuration and the in-loop configuration, which uses the roving receiver coil in the centre of the transmitter loop rather than using a large receiver loop the same size as the transmitter. The transmitter loop size was 100 metres square for this work and readings were taken every 50 metres. The two surveys could be done concurrently.

The final work in this series was the logging of Drillhole WL533, which was done in the same way as the earlier drillhole at Red Hills. This was done several weeks after the rest of the survey work, on May 8th.

All readings resulted from the stacking and averaging of at least 512 double pulses, which is effectively 1024 decay curves. Additionally, two readings were taken at most stations as a check on survey accuracy.

The number of channels of data required was very small since the high resistivities of the background resulted in only 3 or 4 channels of data above noise level. As well as the normal SIROTEM output on paper tape, all data were recorded on magnetic cassette and subsequently read into the Geox computer for analysis and final plotting of the data.

Although certain problems were encountered on this survey, primarily because of breaks in the cable linking the roving receiver to the SIROTEM console, the survey progressed reasonably well. It was shown that SIROTEM data could be achieved fairly economically even in more rugged terrains by this method of fixed transmitter and roving receiver, whereas the use of the more standard coincident or separated loop techniques, which require moving the transmitter loop for each reading, would be prohibitively expensive. While it might be

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convenient to have a roving receiver which did not require a cable linking back to the transmitter loop and console, which would obviously get away from the problem of cable breaks, such a system has the disadvantage that a heavier unit has to be taken along each survey line and the measurement being taken on the survey line requires greater water proofing of the instrument itself.

4. PRESENTATION OF DATA

The data are presented as voltage profiles of the TEM response for each channel at varying scales. These data are shown in Figures 4 - 94 at the back of this report. The relevant transmitter loops for each area are given in Figures 1 - 3.

Respectfully submitted,
GEOEX PTY. LTD.



A.R. DODDS
Senior Geophysicist

No: 82695

14th May, 1982

ARD/pcl

A. SURVEY EQUIPMENT

The SIROTEM equipment consists of a console, power pack, loop cable and connecting leads. SIROTEM has been designed to measure the transient decay over a larger number of channels than other instruments of this type, and to later time delays than ever previously possible. The particular advantage of later times is the ability to record conductors underlying highly conductive overburden and/or highly conductive surrounding hosts. SIROTEM records the transient over 32 contiguous channels out to a maximum time delay of 165 milliseconds. Table 1 gives the specific delay times for each channel. The instrument is very sensitive and has a low inherent noise. It has a degree of ambient noise rejection capability due to its ability to stack up to 4096 (2^{12}) separate readings to obtain the output average. This is performed simultaneously over all channels so that the background noise is common to all channels at the time of measurement. The readings corrected for output current variation are produced automatically on a printer. As opposed to dial readings, they are thereby objective, operator independent and in ready hard-copy form.

The instrument also has a significant amount of in-built data processing capability due to the incorporation of a microprocessor. Thus apparent resistivities - the resistivity the ground would have, were it homogeneous, to yield the response measured - can optionally be printed out for each channel in addition to the voltages.

B. LOOP CONFIGURATIONS

The standard loop configurations used for SIROTEM surveys are diagrammed in Figure A1.

CHANNEL DELAY TIMES AND INTEGRATION WIDTHS

Channel No.	Nominal Mean Delay (msecs)	Nominal Width (msecs)	Actual Integration Window (msecs)
1	0.4	0.4	0.25 - 0.6
2	0.8	0.4	0.65 - 1.0
3	1.2	0.4	1.05 - 1.4
4	1.6	0.4	1.45 - 1.8
5	2.0	0.4	1.85 - 2.2
6	2.6	0.8	2.25 - 3.0
7	3.4	0.8	3.05 - 3.8
8	4.2	0.8	3.85 - 4.6
9	5.0	0.8	4.65 - 5.4
10	5.8	0.8	5.45 - 6.2
11	7.0	1.6	6.25 - 7.8
12	8.6	1.6	7.85 - 9.4
13	10.2	1.6	9.45 - 11.0
14	11.8	1.6	11.05 - 12.6
15	13.4	1.6	12.65 - 14.2
16	15.8	3.2	14.25 - 17.4
17	19.0	3.2	17.45 - 20.6
18	22.2	3.2	20.65 - 23.8
19	25.4	3.2	23.85 - 27.0
20	28.6	3.2	27.05 - 30.2
21	33.4	6.4	30.25 - 36.6
22	39.8	6.4	36.65 - 43.0
23	46.2	6.4	43.05 - 49.4
24	52.6	6.4	49.45 - 55.8
25	59.0	6.4	55.85 - 62.2
26	68.6	12.8	62.25 - 75.0
27	81.4	12.8	75.05 - 87.8
28	94.2	12.8	87.85 - 100.6
29	107.0	12.8	100.65 - 113.4
30	119.8	12.8	113.45 - 126.2
31	139.0	25.6	126.25 - 151.8
32	164.6	25.6	151.85 - 177.4

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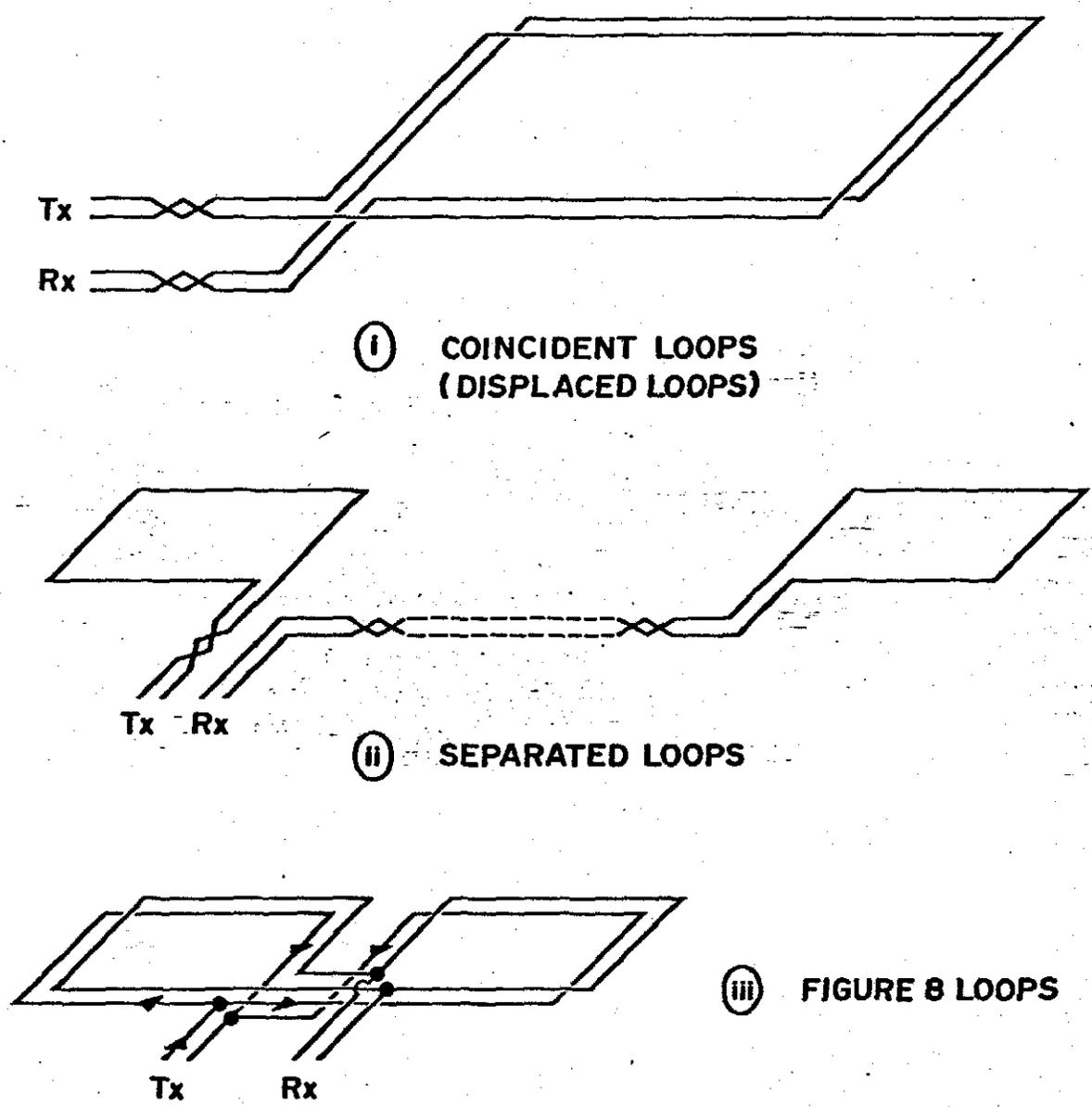


Figure A.1 Loop Configurations.

The most commonly used configuration for reconnaissance work is the coincident transmitter-receiver loop configuration. For this configuration, the transmitter and receiver loops are separated by a negligible distance or may even use the same wire. The loops are normally square with side length ranging from 25 - 200 metres, 100 metres being the most commonly used size. Adequate coverage is normally given by a station spacing of half the loop dimension, that is with a 50% overlap. Results of modelling studies, and experience, indicate that the depth penetration varies with the loop size and is, to an order of magnitude, equal to it. Thus with 100 metre square loops a depth penetration of the order of 100 metres can be expected.

The main advantages of the coincident loop configuration are that the wires are simple to move and thus a satisfactory data production rate can be achieved. Also the resulting data is relatively easy to interpret. The major disadvantage is that the configuration couples well with horizontal conductors, such as conductive overburden, so that the response from steeply dipping bedrock conductors can be swamped in the early channels. However, experience has shown that bedrock conductors usually result in satisfactory anomalies in the later channels, when the response from the overburden has died away. It might also be regarded as a disadvantage that the response for a narrow, steeply dipping conductor can be double-peaked, with a low response when the loops are directly over the conductor and high responses half a loop dimension to either side of the conductor itself. This can make the interpretation less obvious.

A variation of the coincident loop configuration has been devised for situations where the surface resistivities are very high or, more importantly, where strongly magnetic material is present in the immediate vicinity of the surface and close to the wires. This configuration is called the displaced loop configuration and is the same as coincident loops except that the transmitter and receiver loops are

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off-set from each other by a distance of approximately 2 metres. Although more cumbersome to use than the coincident loop configuration, this method has the advantage that the results are guaranteed free from the contaminating effects of near-wire materials, and thus encourage more confident and more detailed interpretation.

Another frequently used layout is the separated loop configuration, also shown in Figure A1. For this configuration the transmitter and receiver loops are separated by distance, ranging from 1-3 loop dimensions, the loops themselves being usually 50 or 100 metres square. The station interval varies from a half to one loop dimension.

The separated loop configuration is rather more cumbersome in field use than coincident loops and requires more wire laid out on the ground. However, it has the advantages that it couples less well with conductive overburden, at least in the early channels, and also produces an anomaly directly over the conductor, which can simplify interpretation considerably. It might be regarded as an advantage also that anomalies with this configuration have a negative polarity and frequently stand out more clearly with standard plotting techniques. A disadvantage of the configuration is that the response from a homogeneous or two-layer half space is more complex, with a change in polarity frequently occurring between early and late channels. Additionally the effect of a vertical or steeply dipping change in sub-surface resistivity can cause a response which looks like the anomaly from a discrete conductor.

The third basic loop configuration, which is less commonly used, is the figure eight configuration, as shown in Figure A1-C. This configuration was designed specifically to maintain the advantages of coincident loops, but also increase the coupling to vertical conductors. The wires are

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coincident but have a more complex figure eight pattern. The configuration is, therefore quite cumbersome to use in the field, but has the advantages that vertical conductors couple rather better than with coincident loops and, most significantly, an anomaly is produced directly over the conductor, as well as minor anomalies on either side. This configuration is normally only used in detailing or specific interest situations.

C. DATA PRESENTATION FORMATS

The standard data presentation is of the instrument output of normalised transient voltages, in units of microvolt/amp, plotted as profiles for each line, with a linear horizontal distance scale and a logarithmic vertical voltage scale. This convention allows the full range of voltages to be plotted on a reasonable sized graph and still allows the major features on each decay profile to be easily seen. Error bars are plotted to show the range of recorded values for each station and each delay time and provide an estimate of the accuracy of the reading.

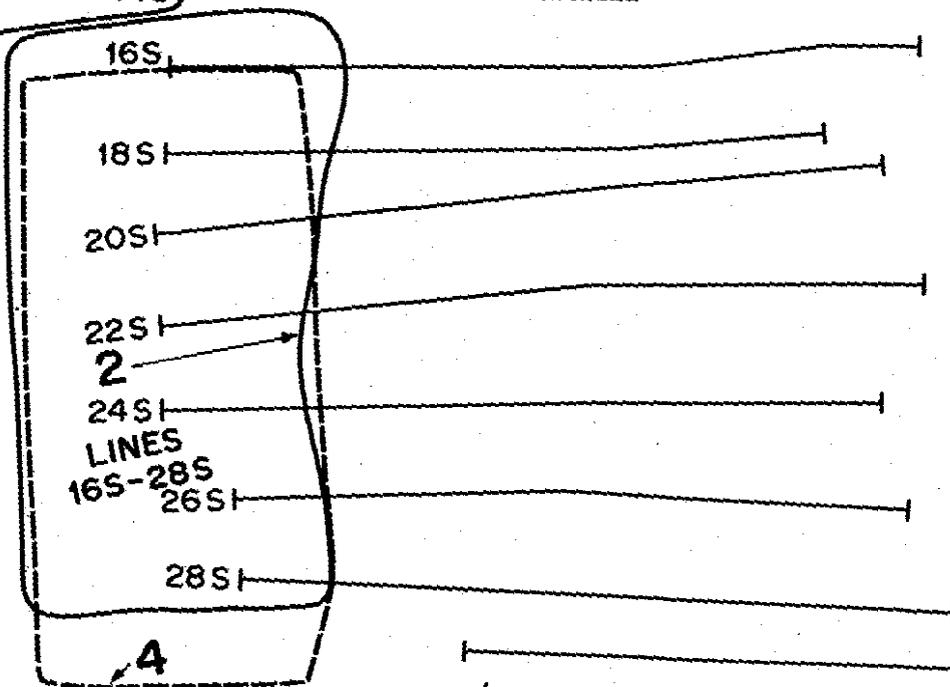
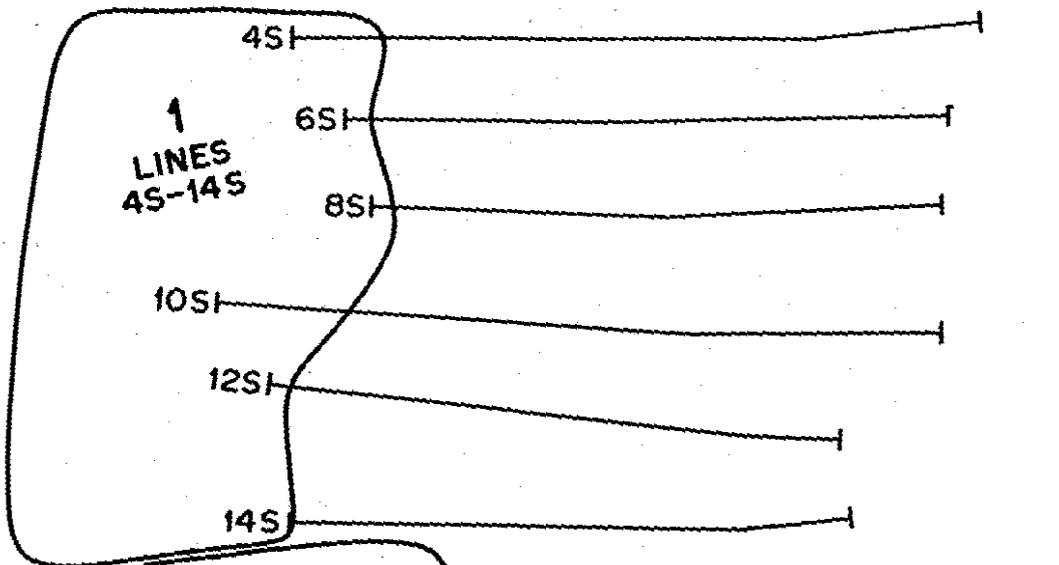
One disadvantage of the above plotting technique is that variations in the voltage level from channel to channel are not evident. This can be overcome by calculating the apparent resistivities and plotting these on a resistivity time-distance plot. The horizontal scale is again a linear distance scale. The vertical scale in this case plots the channel delay times on a logarithmic scale. The value of the apparent resistivity is plotted at the intersection of the station location and the relevant channel number, and the results then contoured. Since there is a relationship between the delay time and the depth penetration for a given reading, the resistivity time-distance plots provide the diagrammatic representation of the resistivity layering.

in the ground in the absence of finite conductors.

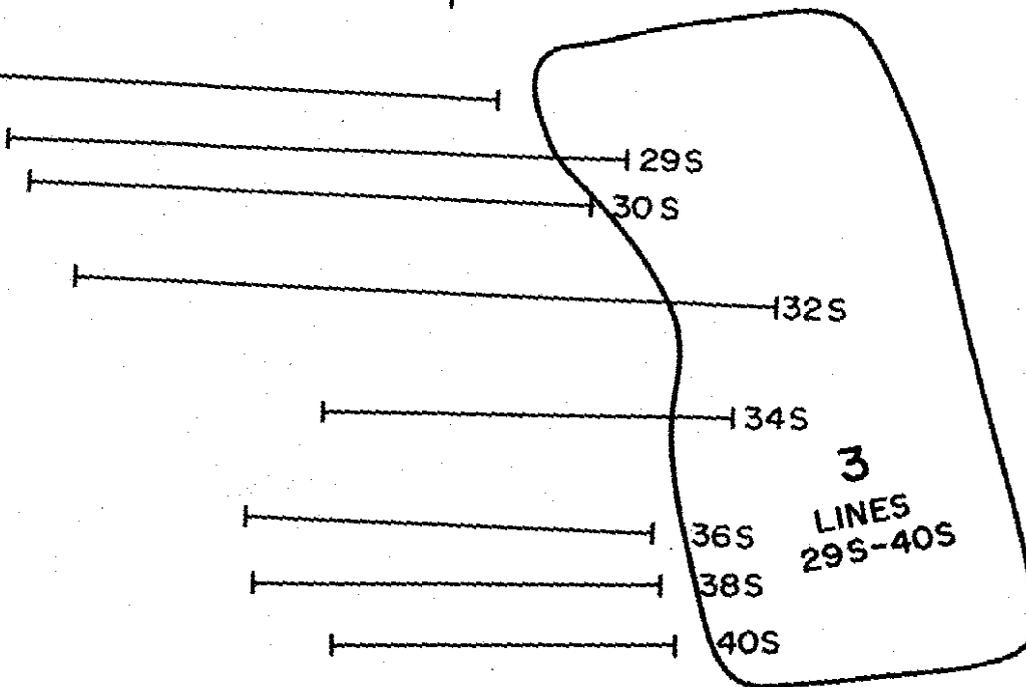
It is also possible to plot the apparent resistivities for a given channel on a plan map, thereby showing the lateral variations over the whole grid of the response at a given time delay. On such plan contours the early channels tend to represent the near-surface or overburden resistivity variations while the later channels show more of the bedrock response and less response from the overburden.

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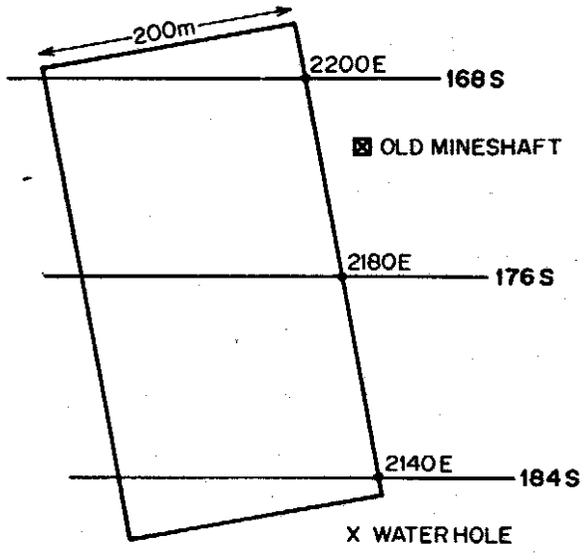


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DEPT. OF MINES				E & IL
REF. No. 10076/84				

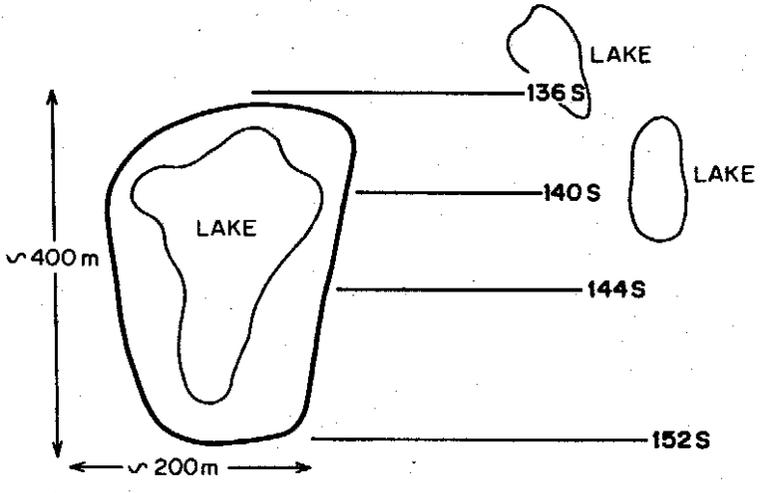


RED HILLS TRANSMITTER LOOPS

FIG. 1



LOOP 1



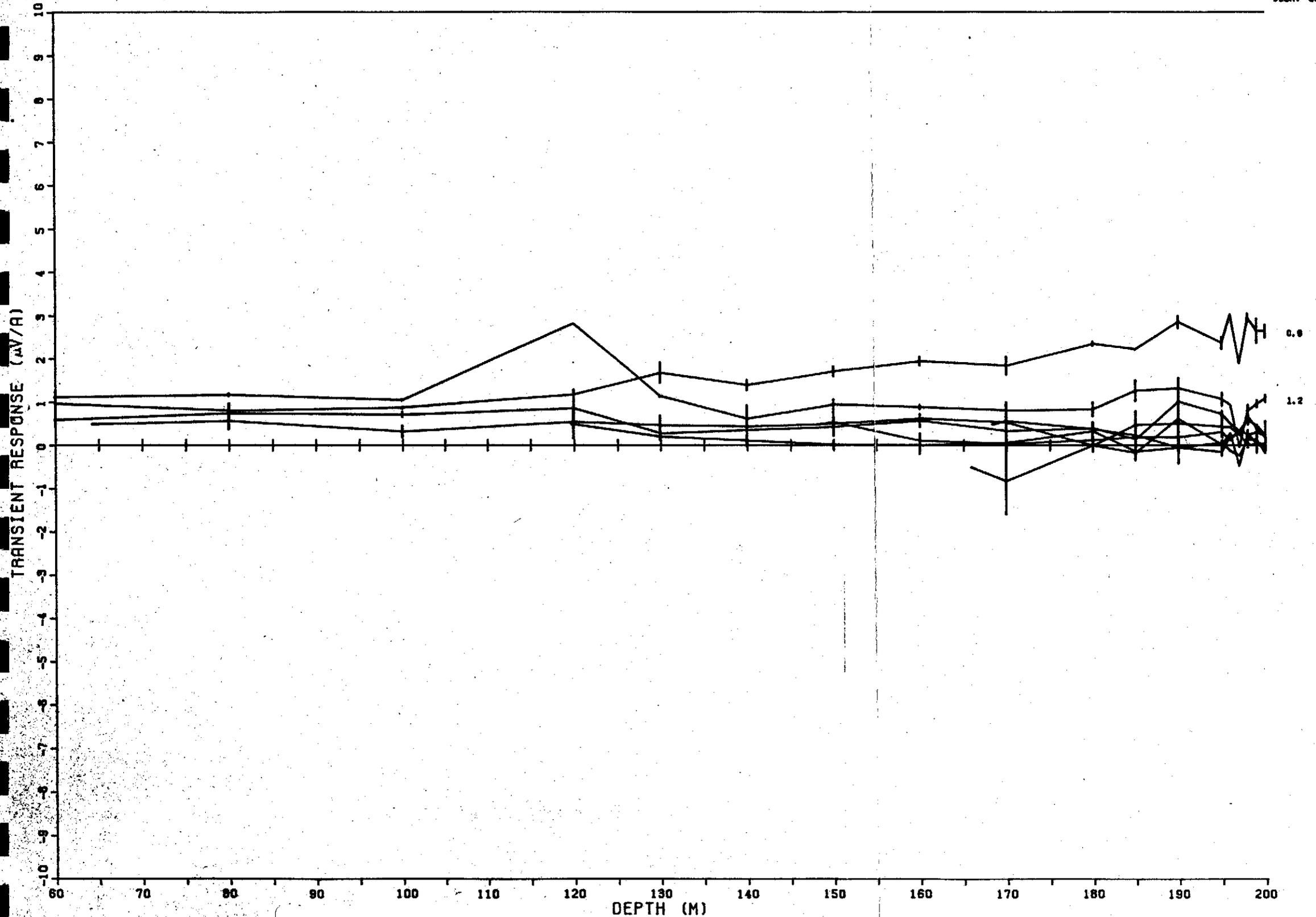
LOOP 2

DORA-SPICER TRANSMITTER LOOPS

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DELAT (MSEC)

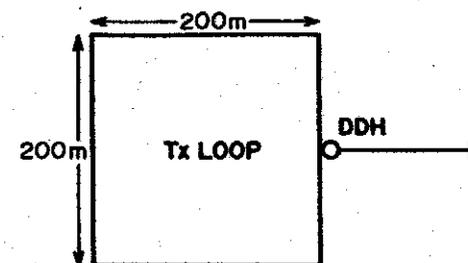


5 cm

INSTRUMENT : SIROTEM
 CONFIGURATION : 200M SQUARE TRANSMITTER LOOP,
 DRILL HOLE SURVEY
 READING INTERVAL 5M

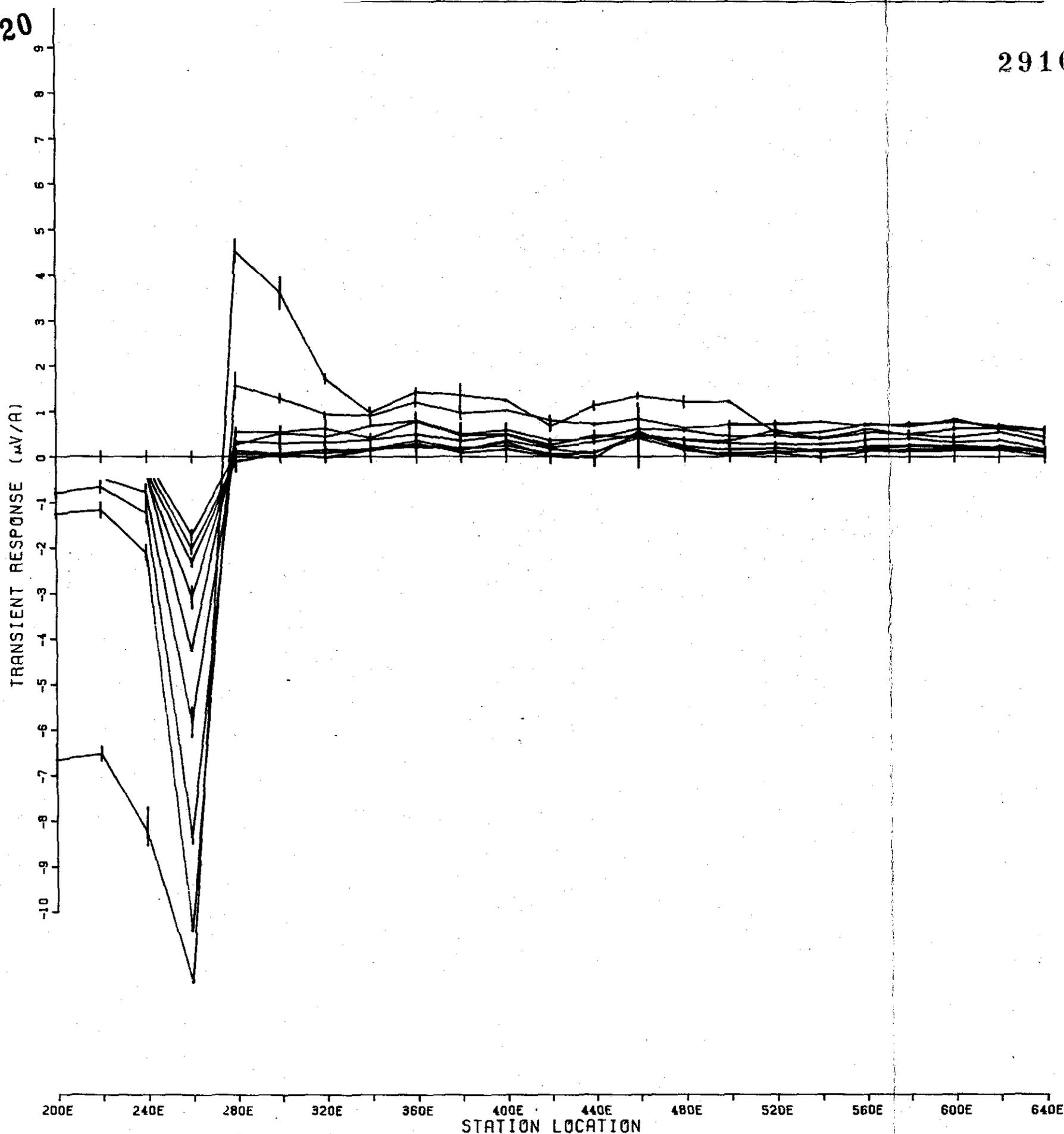
SCALE : 1:500
 DATE : 29/1/82
 MAP : QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 DDH RH-5, PROSPECT RED HILLS



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200E 240E 280E 320E 360E 400E 440E 480E 520E 560E 600E 640E

STATION LOCATION

INSTRUMENT :SIADTEM
 CONFIGURATION:200M X 400M TRANSMITTER LOOP.1
 TURAM MODE (RVP) SURVEY
 READING INTERVAL 20M

SCALE: 1:2000
 DATE: 4/2/82
 MAP: QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 4S, VERTICAL COMP., PROSPECT RED HILLS

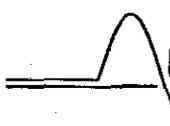
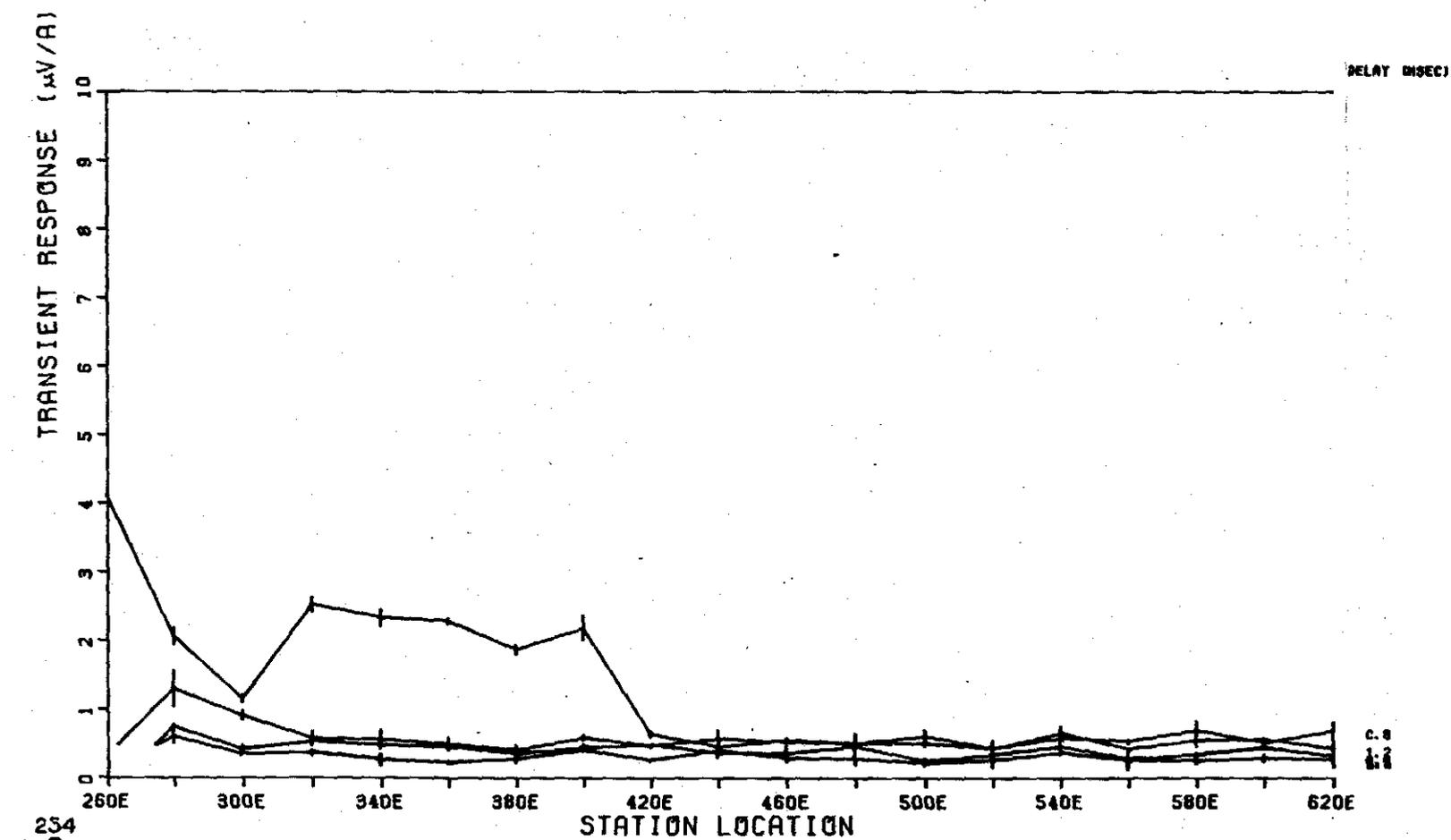
 **GEOEX**
 /PTY LTD

FIG 10(a)

5 cm

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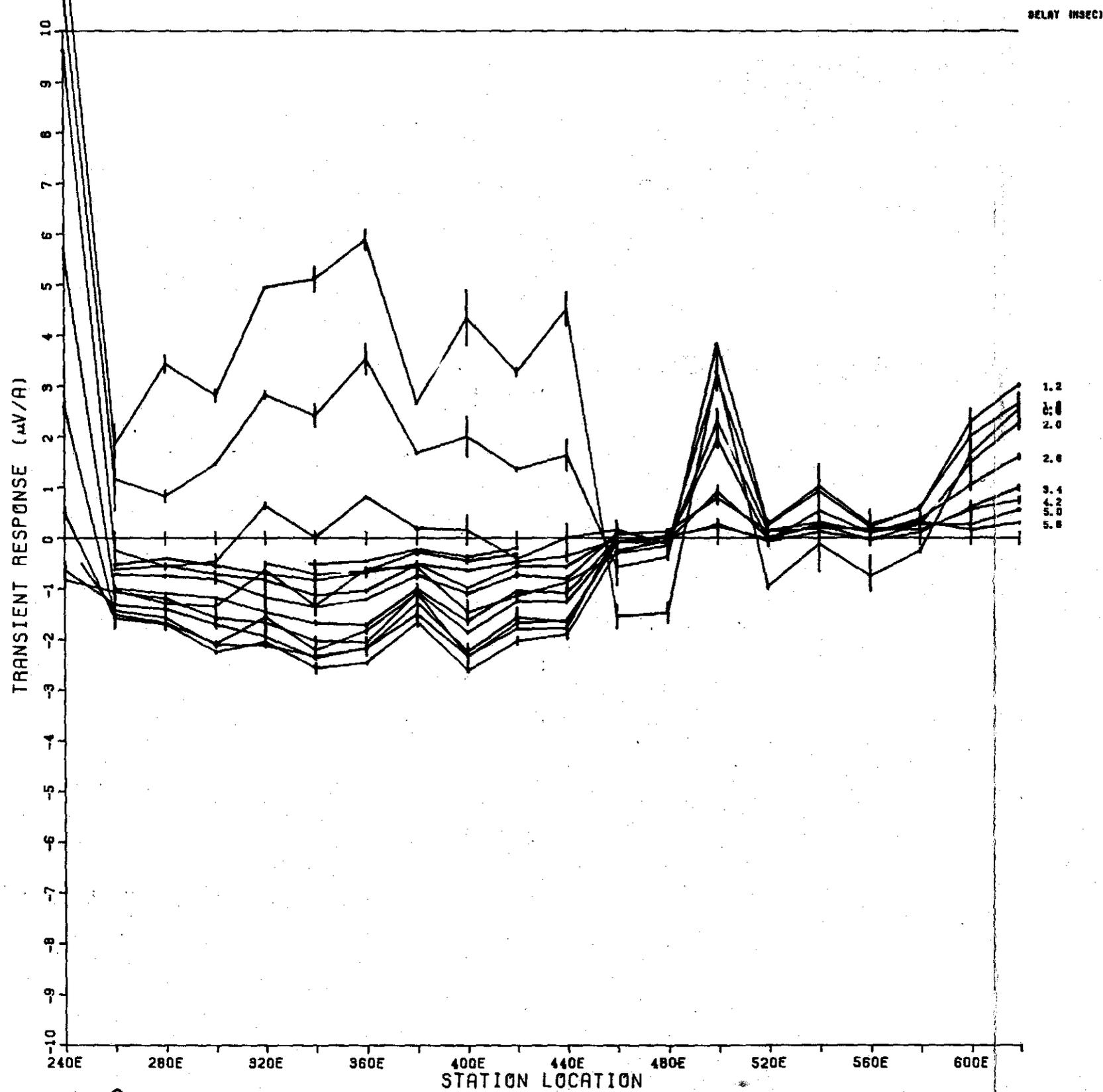
INSTRUMENT :SIROTEM
 CONFIGURATION:200M X 400M TRANSMITTER LOOP.1
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

SCALE: 1:2000
 DATE : 5/2/82
 MAP : QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 6S, VERTICAL COMP., PROSPECT RED HILLS

GEOEX
 PTY LTD

5 cm



INSTRUMENT : SIROTEM
 CONFIGURATION : 200M X 400M TRANSMITTER LOOP,
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

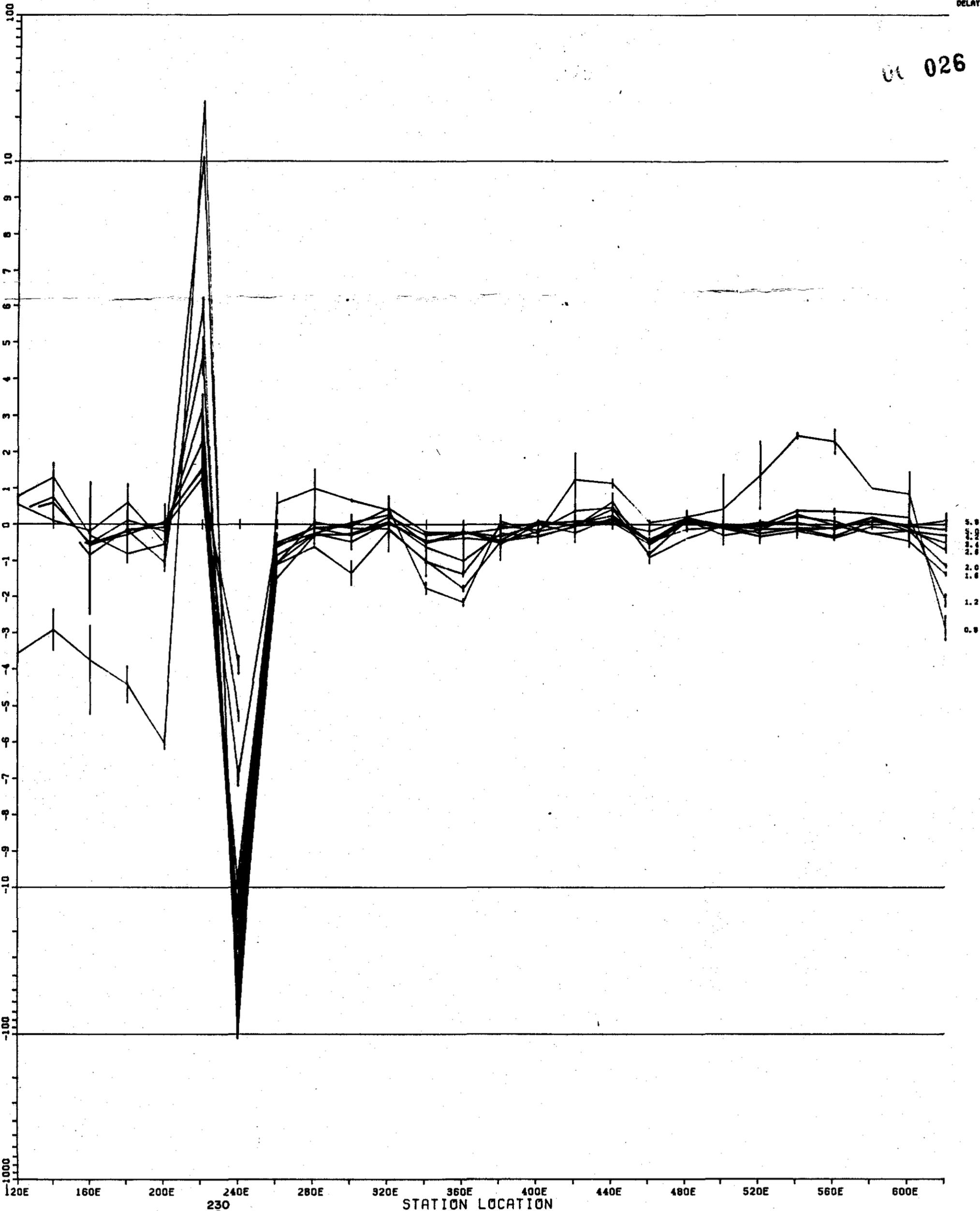
SCALE : 1:2000
 DATE : 6/2/82
 MAP : QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 8S, VERTICAL COMP., PROSPECT RED HILLS

GEOEX
 PTY LTD

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INSTRUMENT :SIROTEM
 CONFIGURATION:200M X 400M TRANSMITTER LOOP,1
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

SCALE: 1:2000
 DATE : 7/2/82
 MAP : QUEENSTOWN, TAS.

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. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 10S.VERTICAL COMP., PROSPECT RED HILLS

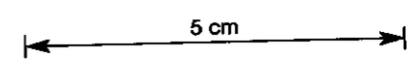
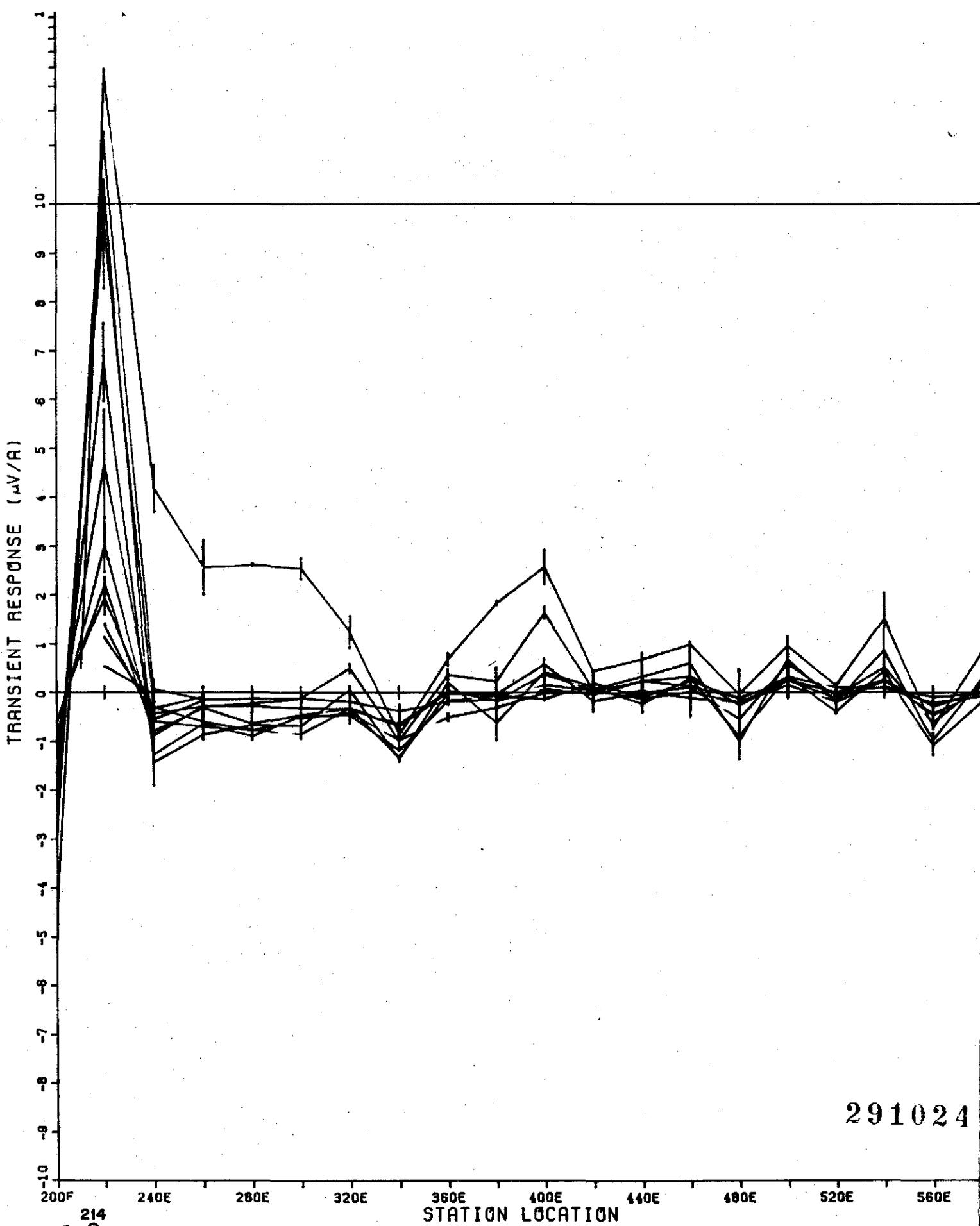


FIG 10(d)



INSTRUMENT : SIROTEM
 CONFIGURATION : 200M X 400M TRANSMITTER LOOP, 1
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

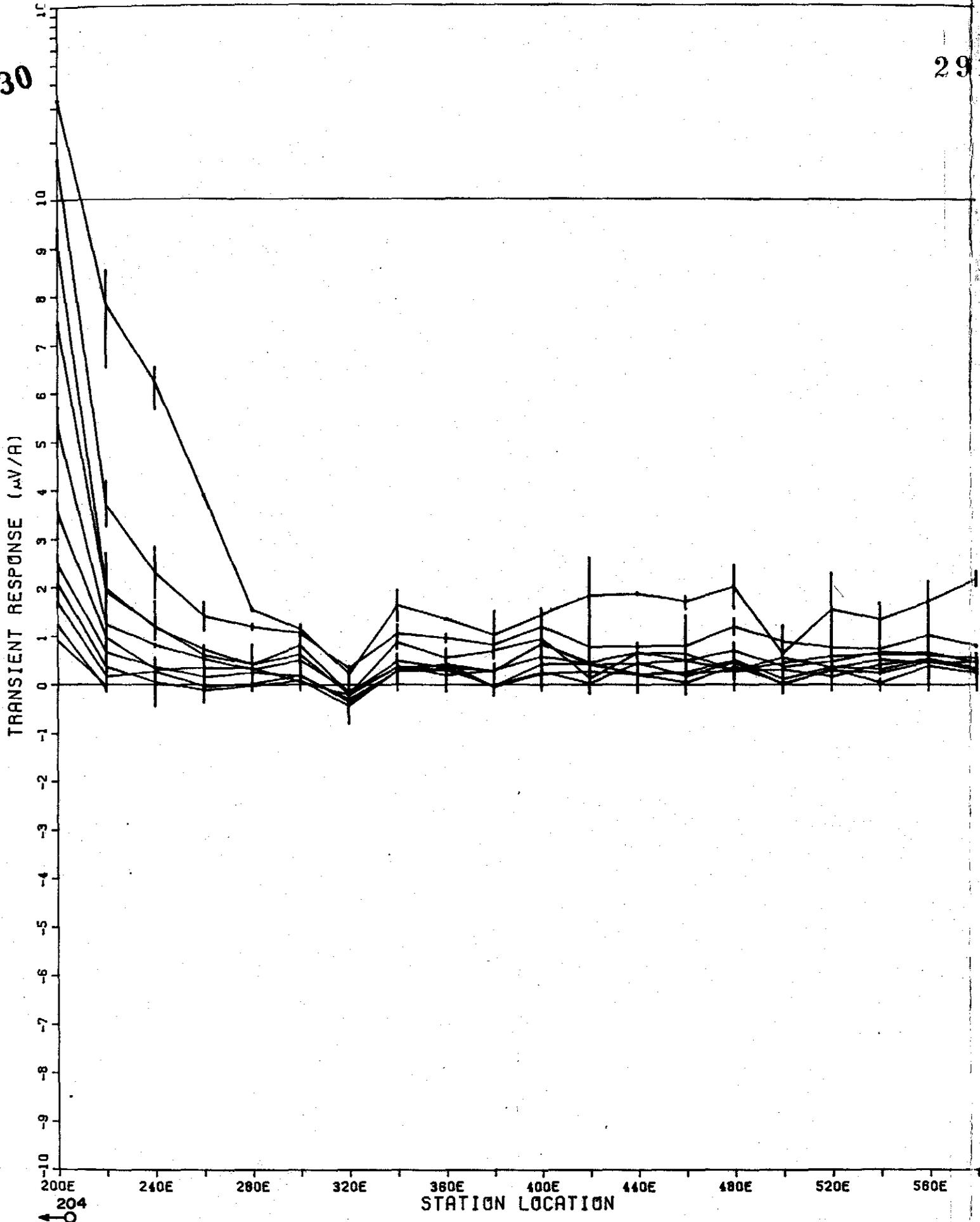
SCALE : 1:2000
 DATE : 7/2/82
 MAP : QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 12S, VERTICAL COMP., PROSPECT RED HILLS



5 cm

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0.0
1.2
2.4

5 cm

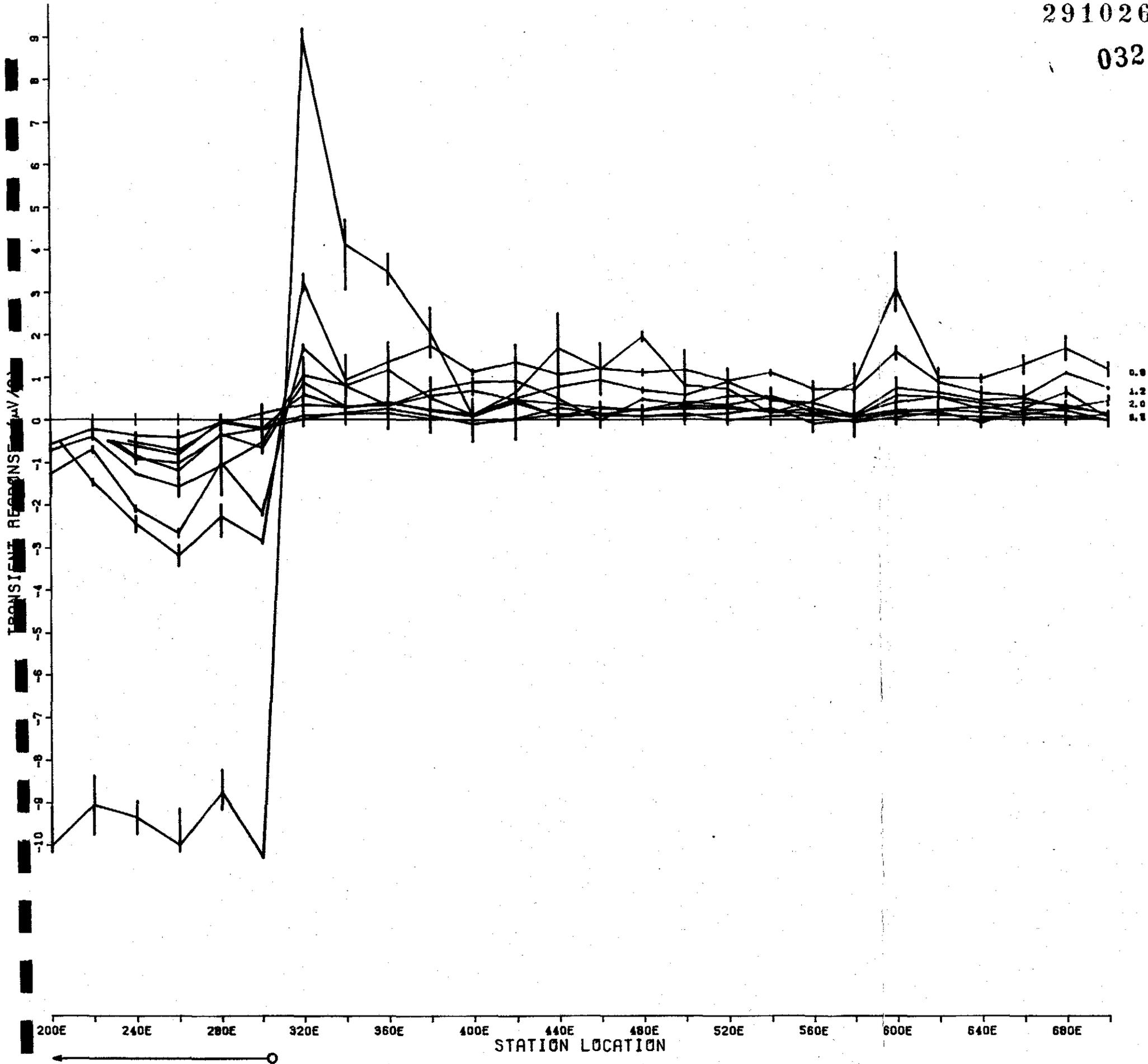
INSTRUMENT :SIROTEM
 CONFIGURATION:200M X 400M TRANSMITTER LOOP,
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

SCALE: 1:2000
 DATE : 8/2/82
 MAP : QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 14S VERTICAL CAMP PROSPECT RED HILLS



FIG 10A



INSTRUMENT : SIROTEM
 CONFIGURATION : 200M X 400M TRANSMITTER LOOP, 2
 TURAH MODE (RVR) SURVEY
 READING INTERVAL 20M

SCALE : 1:2000
 DATE : 10/2/82
 MAP : QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 E16S VERTICAL COMP., PROSPECT RED HILLS

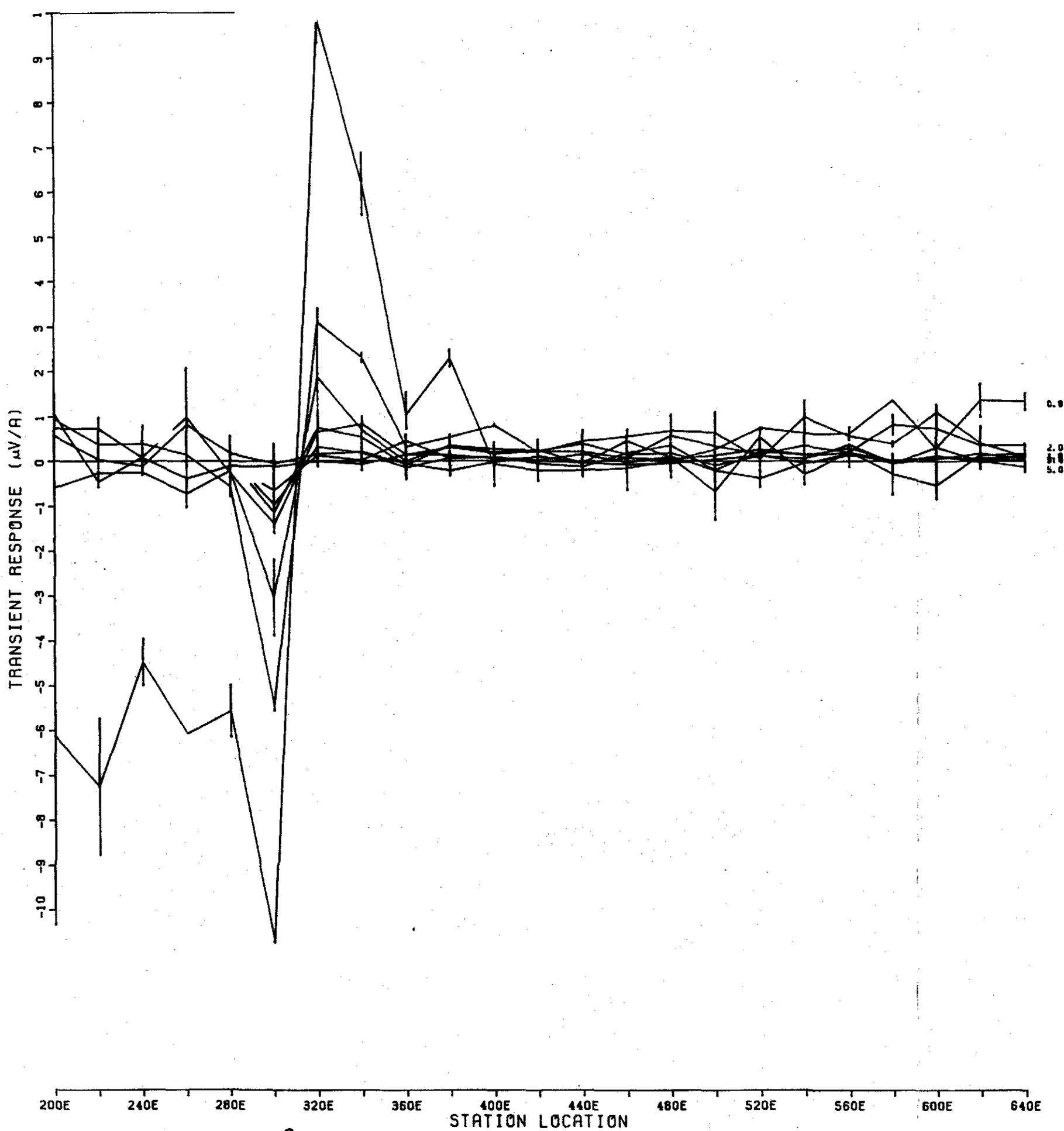
GEOEX
 /PTY LTD

FIG 10(9)

5 cm

291027

034



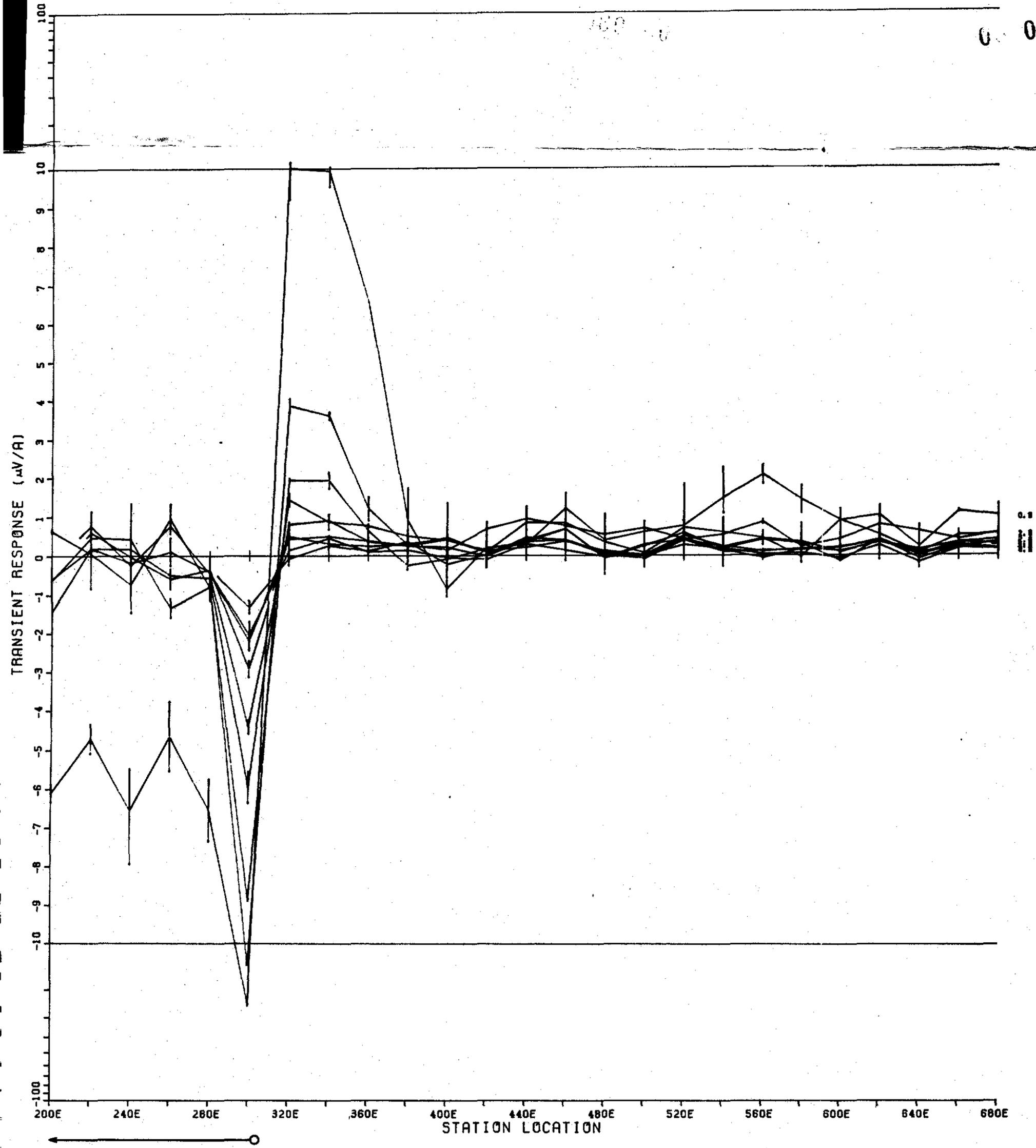
INSTRUMENT :SIROTEM
 CONFIGURATION:200M X 400M TRANSMITTER LOOP.2
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

SCALE: 1:2000
 DATE: 11/2/82
 MAP: QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 NF 185 VERTICAL COMP PROSPECT RED HILLS

GEOEX
 /PTY LTD

5 cm



INSTRUMENT : SIROTEH
 CONFIGURATION : 200M X 400M TRANSMITTER LOOP, 2
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

SCALE : 1:2000
 DATE : 11/2/82
 MAP : QUEENSTOWN, TAS.

291028

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 20S, VERTICAL COMP., PROSPECT RED HILLS



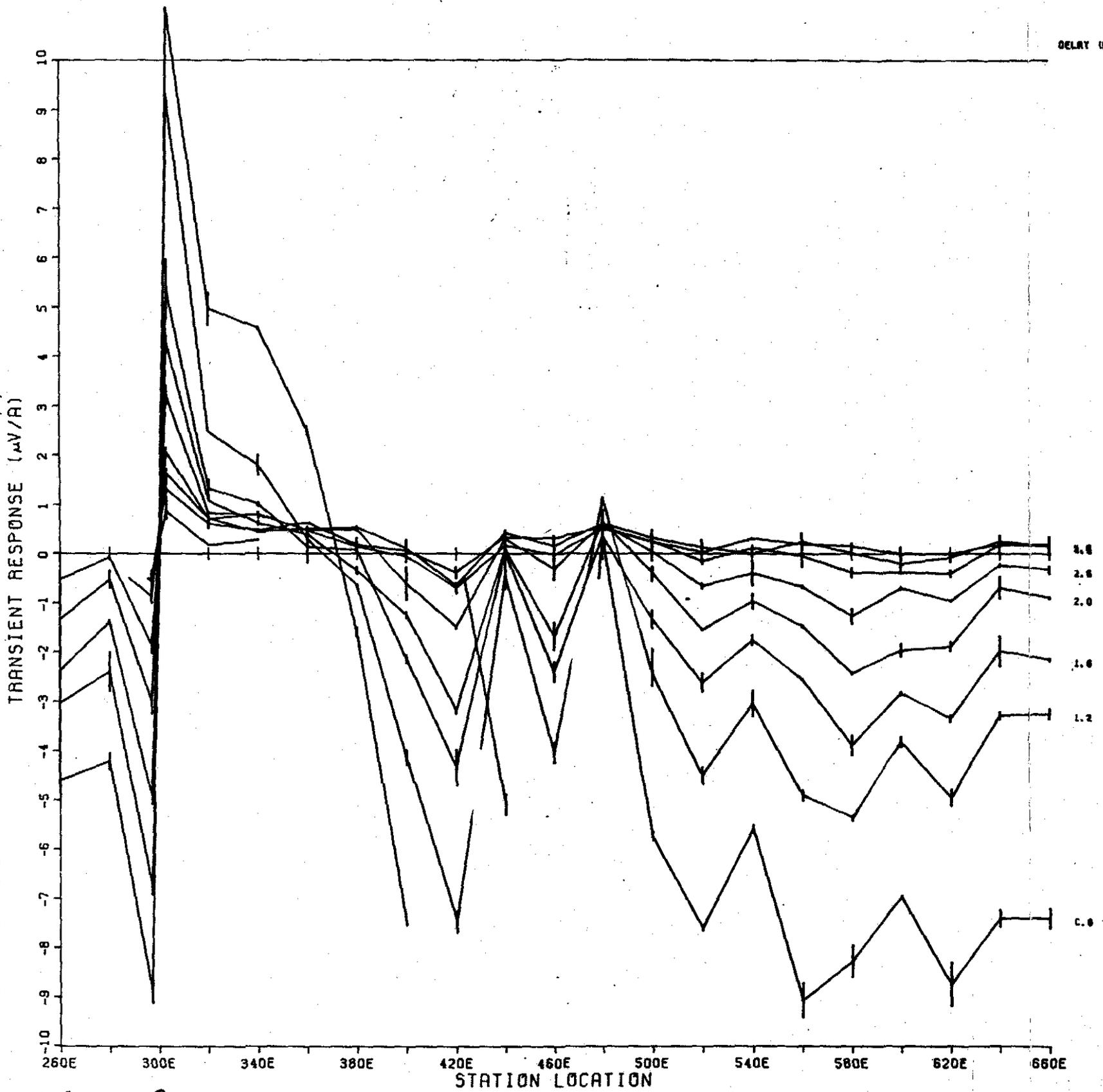
5 cm

FIG 10(i)

291029

038

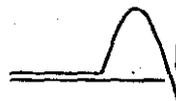
DELAY (MSEC)



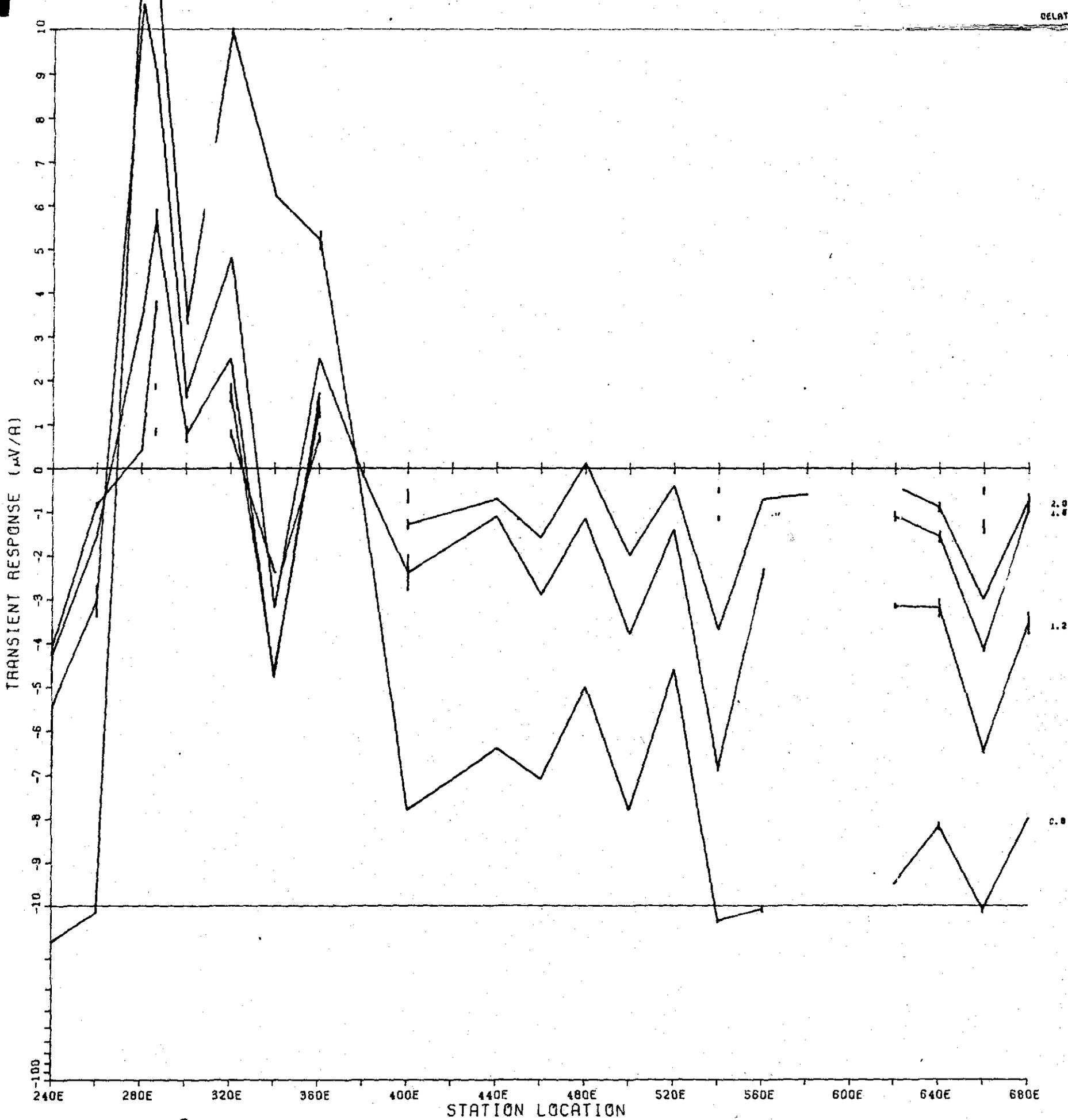
INSTRUMENT : SIRTEM
CONFIGURATION: 200M X 400M TRANSMITTER LOOP, 4
TURAM MODE (AVA) SURVEY
READING INTERVAL 20M

SCALE: 1:2000
DATE: 9/4/82
MAP: QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
TRANSIENT E.M. PROFILE
LINE 22S, VERT. COMP., PROSPECT RED HILLS

 **GEOEX**
PTY LTD

5 cm

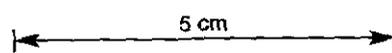


INSTRUMENT : SIROTEM
 CONFIGURATION : 200M X 400M TRANSMITTER LOOP, 4
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

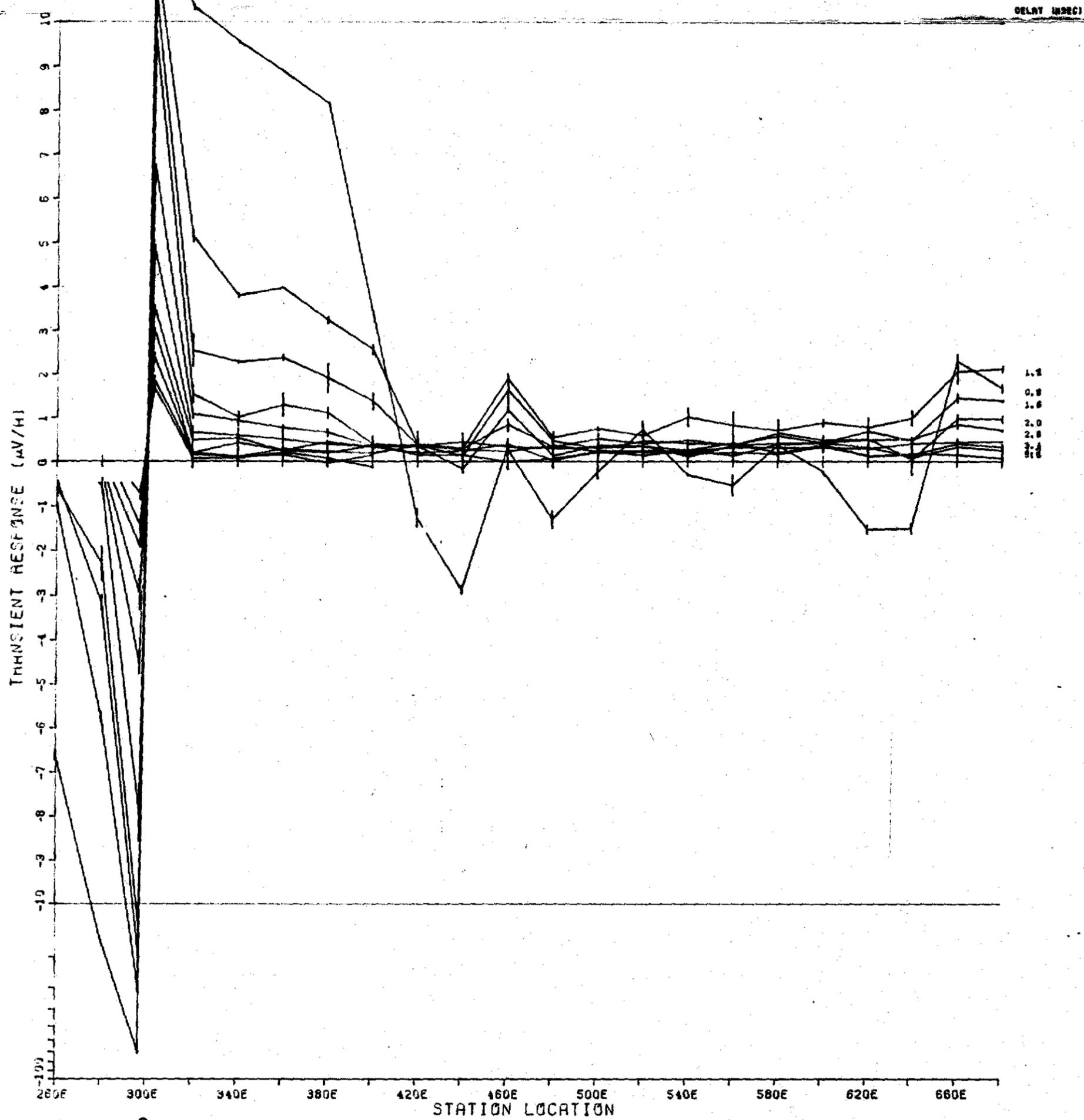
SCALE : 1:2000
 DATE : 9/4/82
 MAP : QUEENSTOWN, TAS.

291030

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 24S, VERT. COMP., PROSPECT RED HILLS



042



INSTRUMENT : SIROTEM
 CONFIGURATION : 200M X 400M TRANSMITTER LOOP, 4
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

SCALE : 1:2000
 DATE : 6/4/82
 MAP : QUEENSTOWN, TAS.

291031

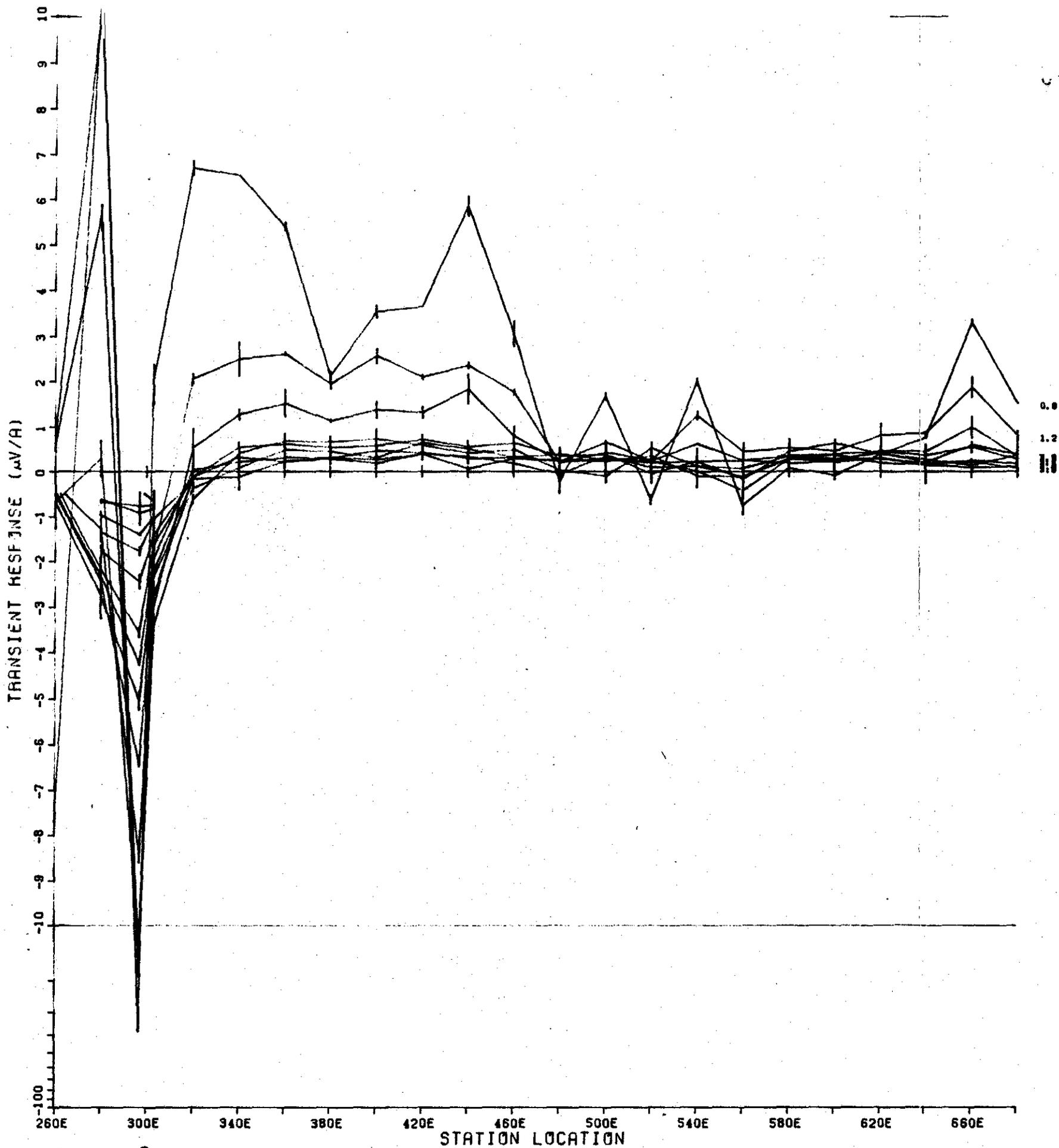
MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 26S. VERT. COMP., PROSPECT RED HILLS



5 cm

FIG 10(1)

044



INSTRUMENT : SIRTEM
CONFIGURATION : 200M X 400M TRANSMITTER LOOP, 3
TURAM MODE (AVR) SURVEY
READING INTERVAL 20M

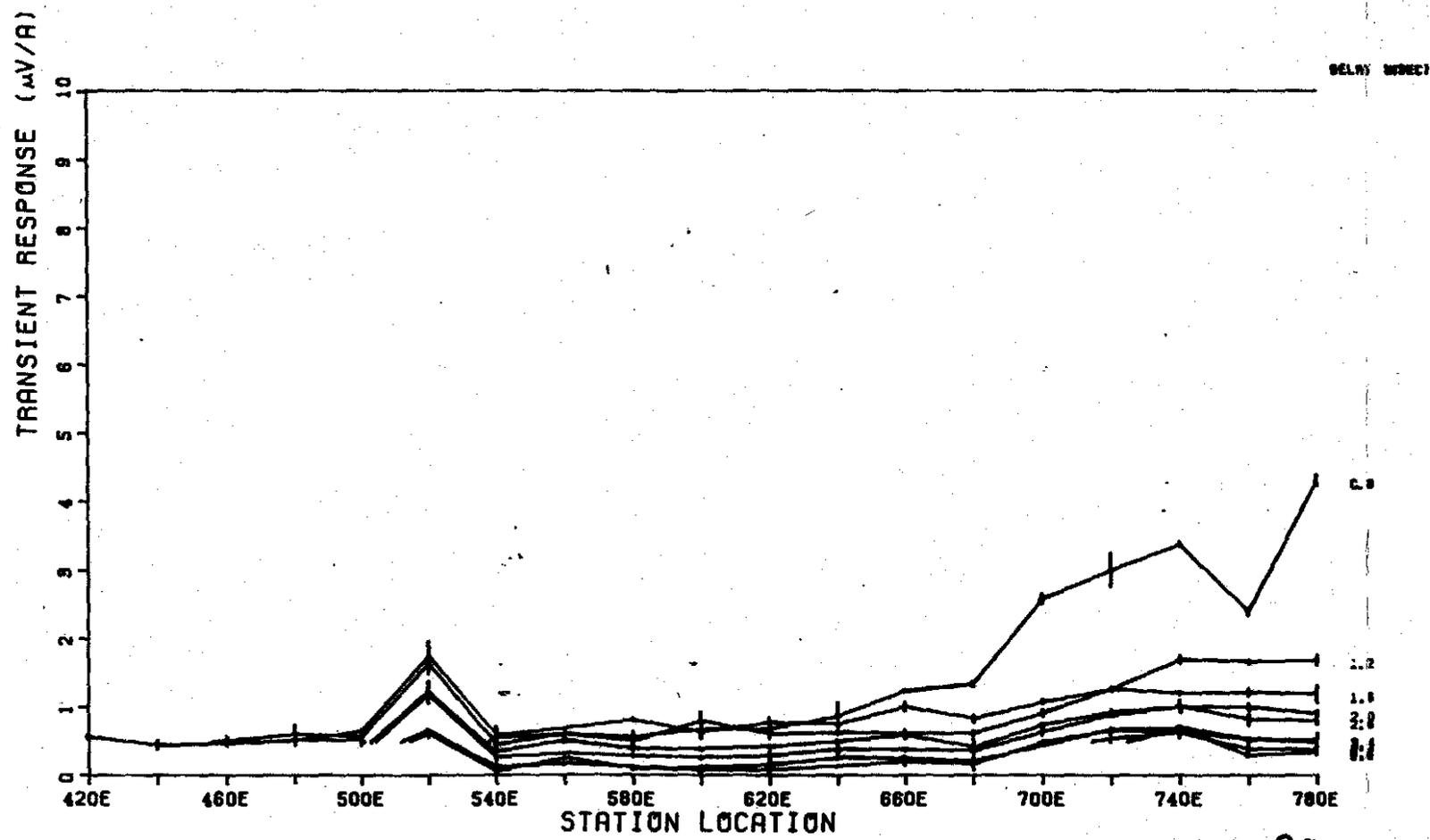
SCALE : 1:2000
DATE : 1/4/82
MAP : QUEENSTOWN, TAS.

291032

MT. LYELL MINING AND RAILWAY CO. LTD.
TRANSIENT E.M. PROFILE
LINE 29S VERT COMP PROSPECT 252 HILL

GEOEX
PTY LTD

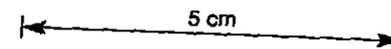
5 cm

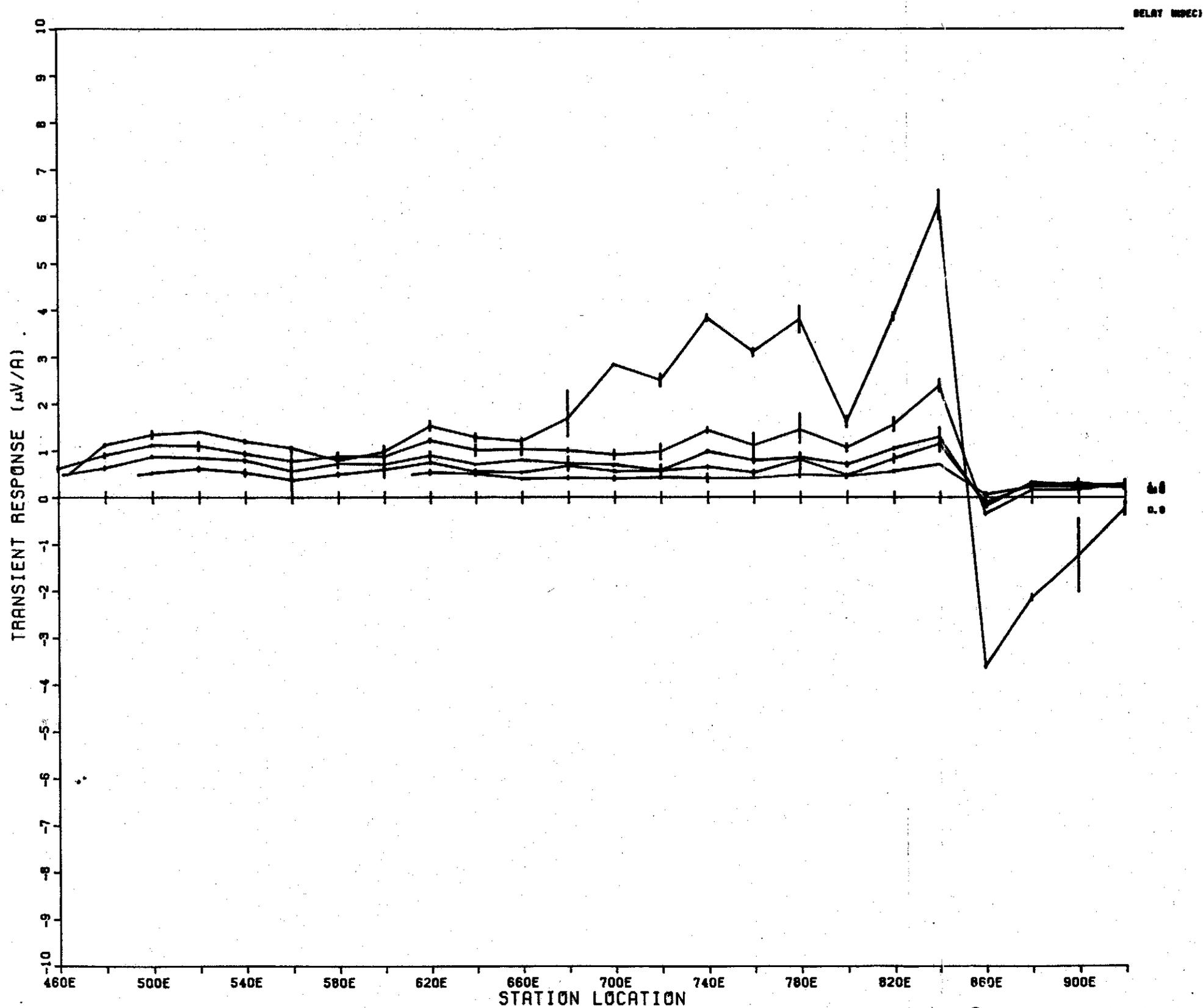


INSTRUMENT :SIRTEM
 CONFIGURATION:200M X 400M TRANSMITTER LOOP.3
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

SCALE: 1:2000
 DATE : 31/1/82
 MAP : QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 30S, VERTICAL COMP., PROSPECT RED HILLS





INSTRUMENT : SIRTEM
 CONFIGURATION : 200M X 400 M TRANSMITTER LOOP, 3
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

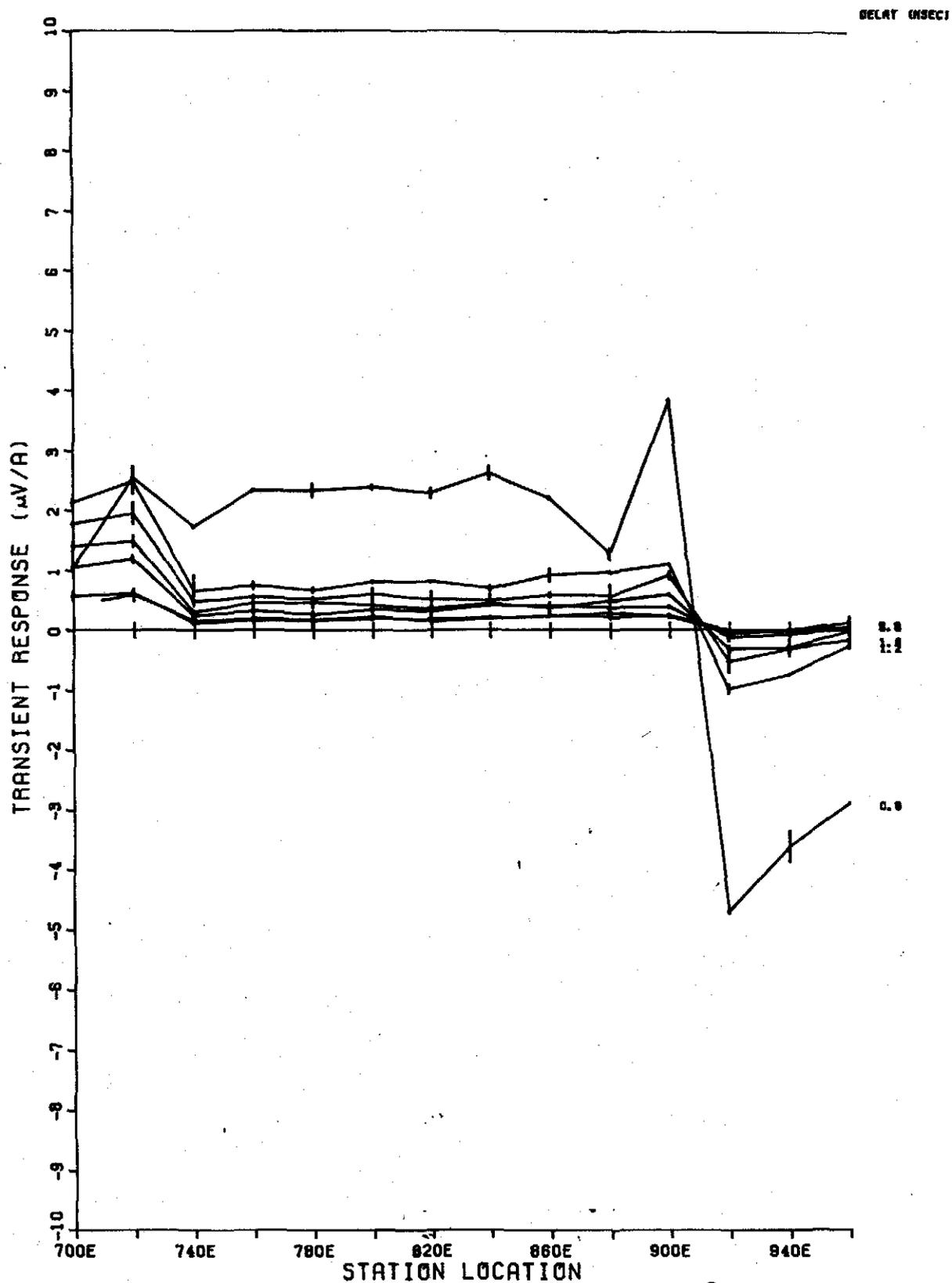
SCALE : 1:2000
 DATE : 1/2/82
 MAP : QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 32S, VERTICAL COMP., PROSPECT RED HILLS

 GEOEX
 PTY LTD

FIG 10(a)

5 cm



INSTRUMENT :SIRTEM
CONFIGURATION:200M X 400M TRANSMITTER LOOP,3
TURAM MODE (AVR) SURVEY
READING INTERVAL 20M

SCALE: 1:2000
DATE : 1/2/82
MAP : QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
TRANSIENT E.M. PROFILE

LINE 34S, VERTICAL COMP., PROSPECT RED HILLS

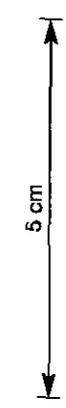
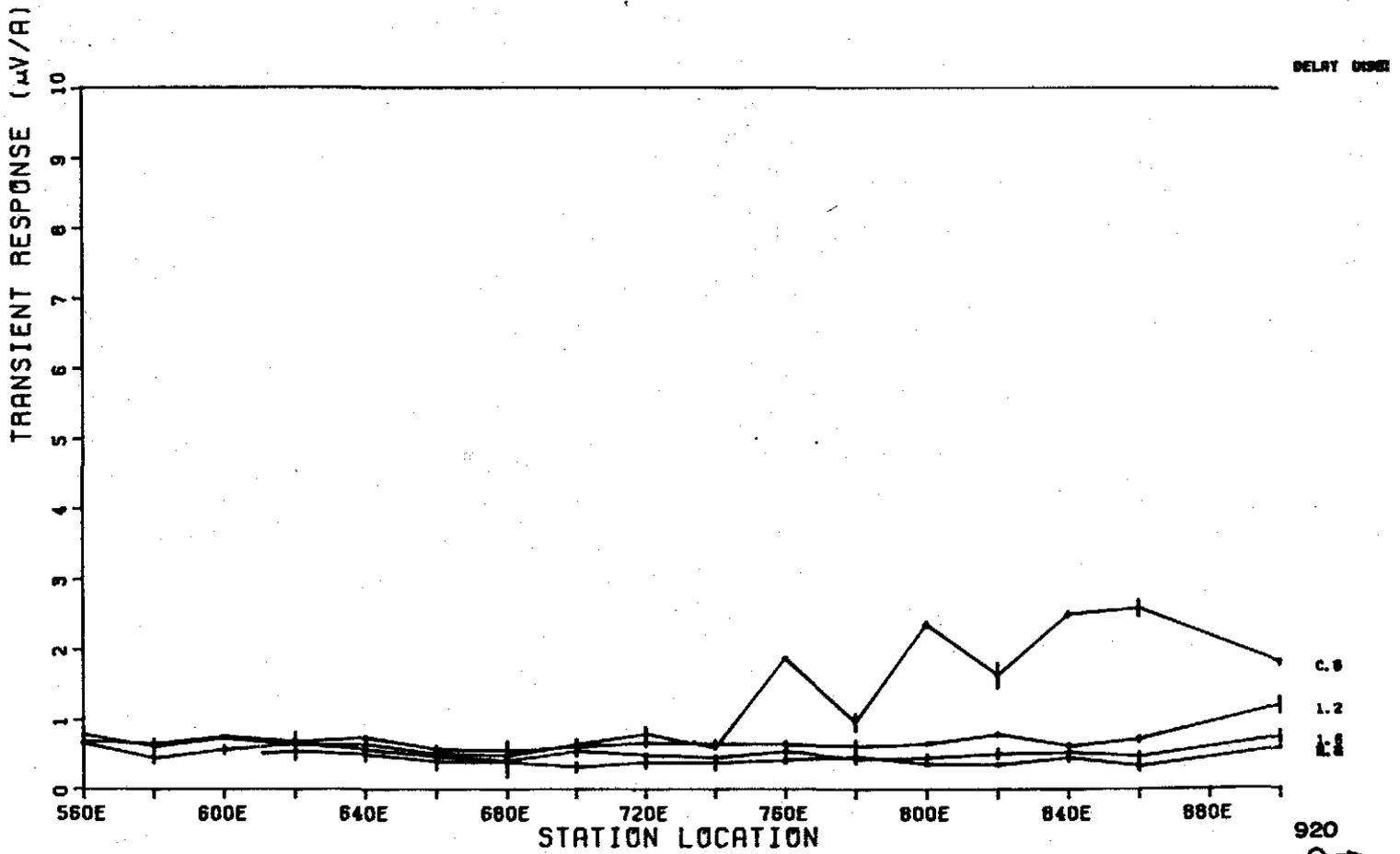
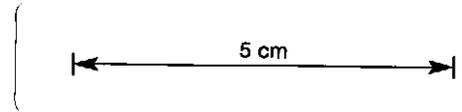


FIG.106



INSTRUMENT : SIRTEM
 CONFIGURATION : 200M X 400M TRANSMITTER LOOP, 3
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

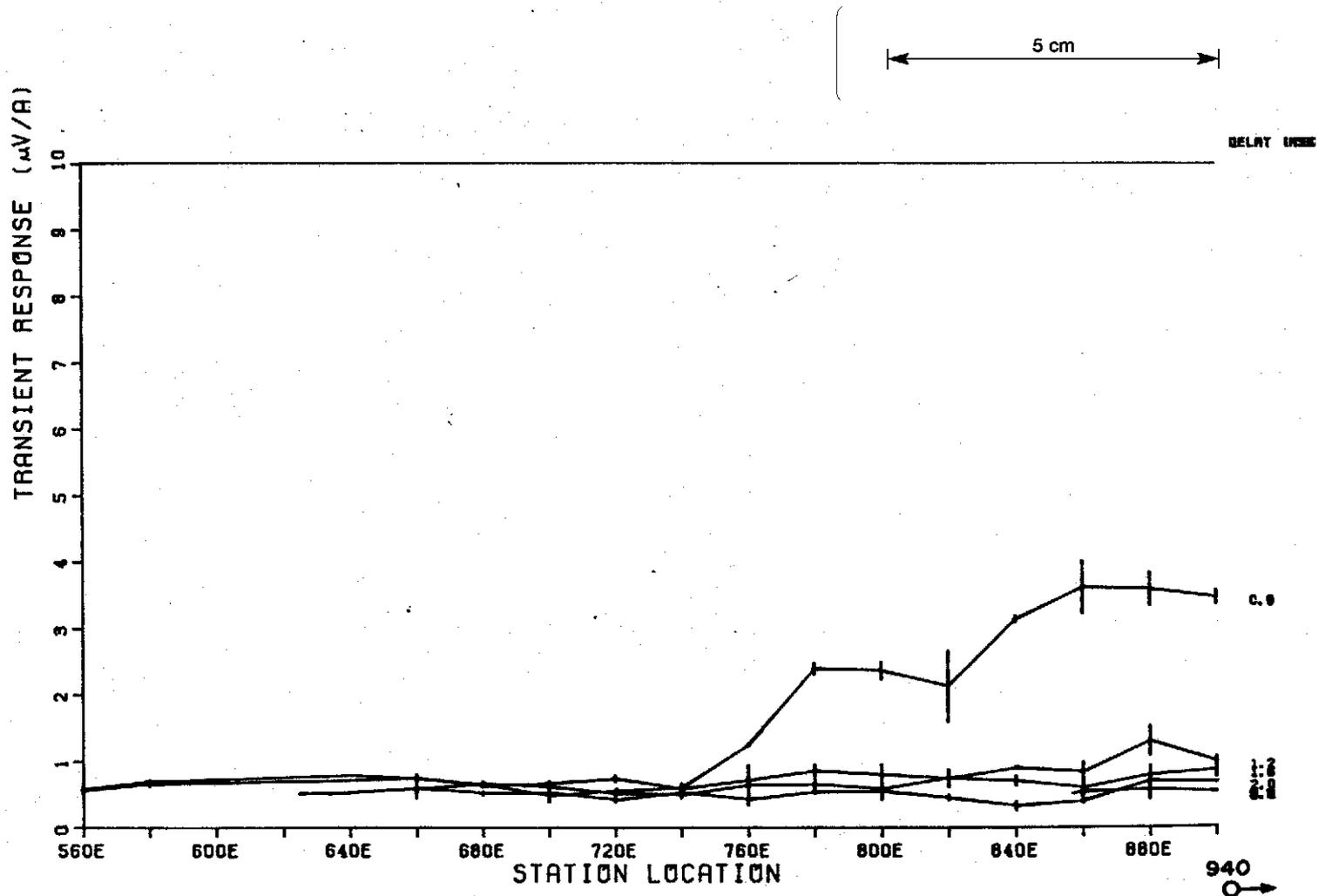
SCALE : 1:2000
 DATE : 2/2/82
 MAP : QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE

LINE 36S, VERTICAL COMP., PROSPECT RED HILLS



FIG.10(r)

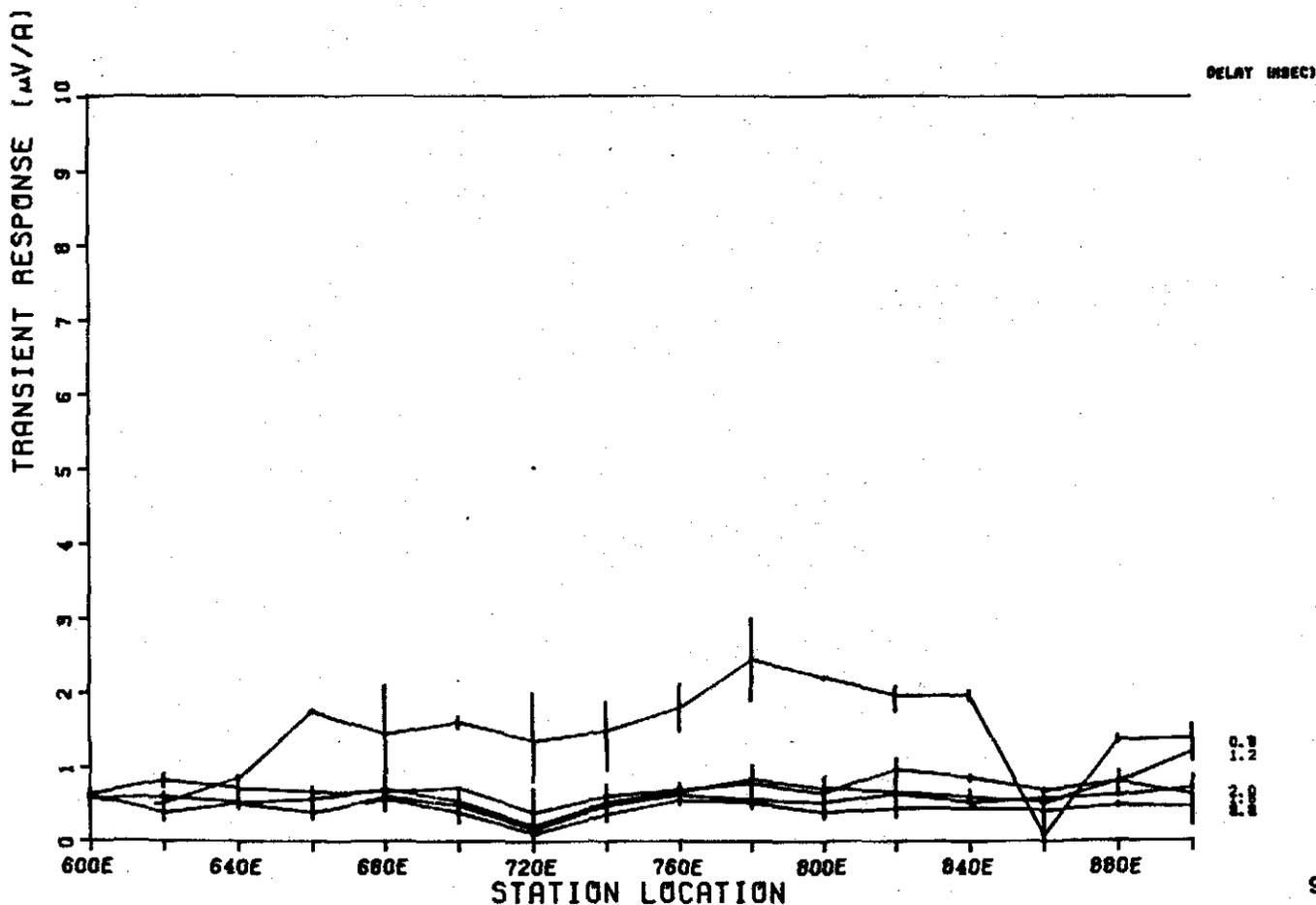
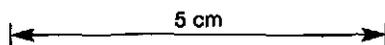


INSTRUMENT :SIROTEM
 CONFIGURATION:200M X 400M TRANSMITTER LOOP,3
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M.

SCALE: 1:2000
 DATE : 2/2/82
 MAP : QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 38S, VERTICAL COMP., PROSPECT RED HILLS



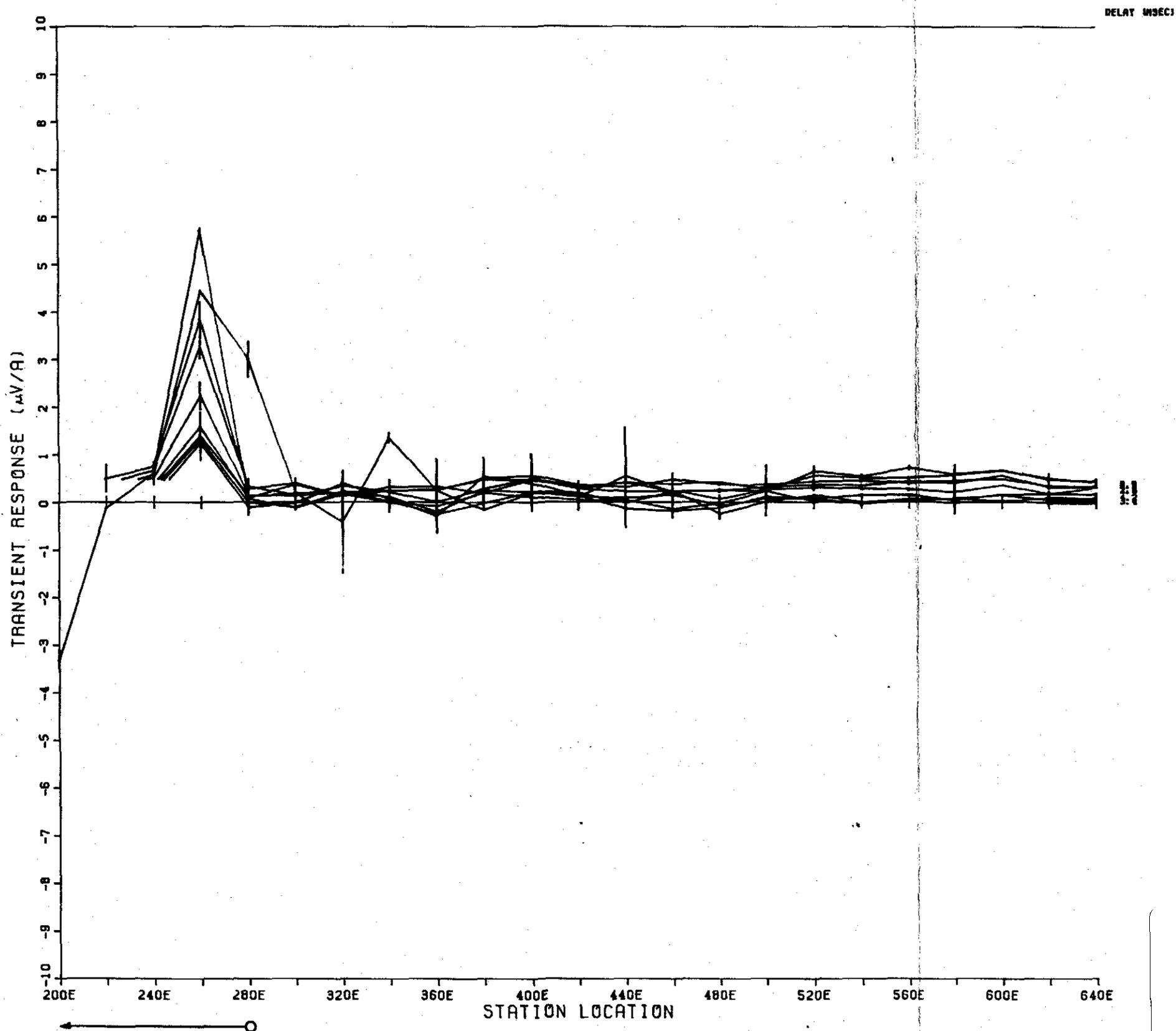


INSTRUMENT :SIROTEM
 CONFIGURATION:200M X 400M TRANSMITTER LOOP,3
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

SCALE: 1:2000
 DATE : 3/2/82
 MAP : QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 40S, VERTICAL COMP., PROSPECT RED HILLS





INSTRUMENT :SIRTEM
 CONFIGURATION:200M X 400M TRANSMITTER LOOP,
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

SCALE: 1:2000
 DATE : 4/2/82
 MAP : QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 4S, E-W COMP., PROSPECT RED HILLS

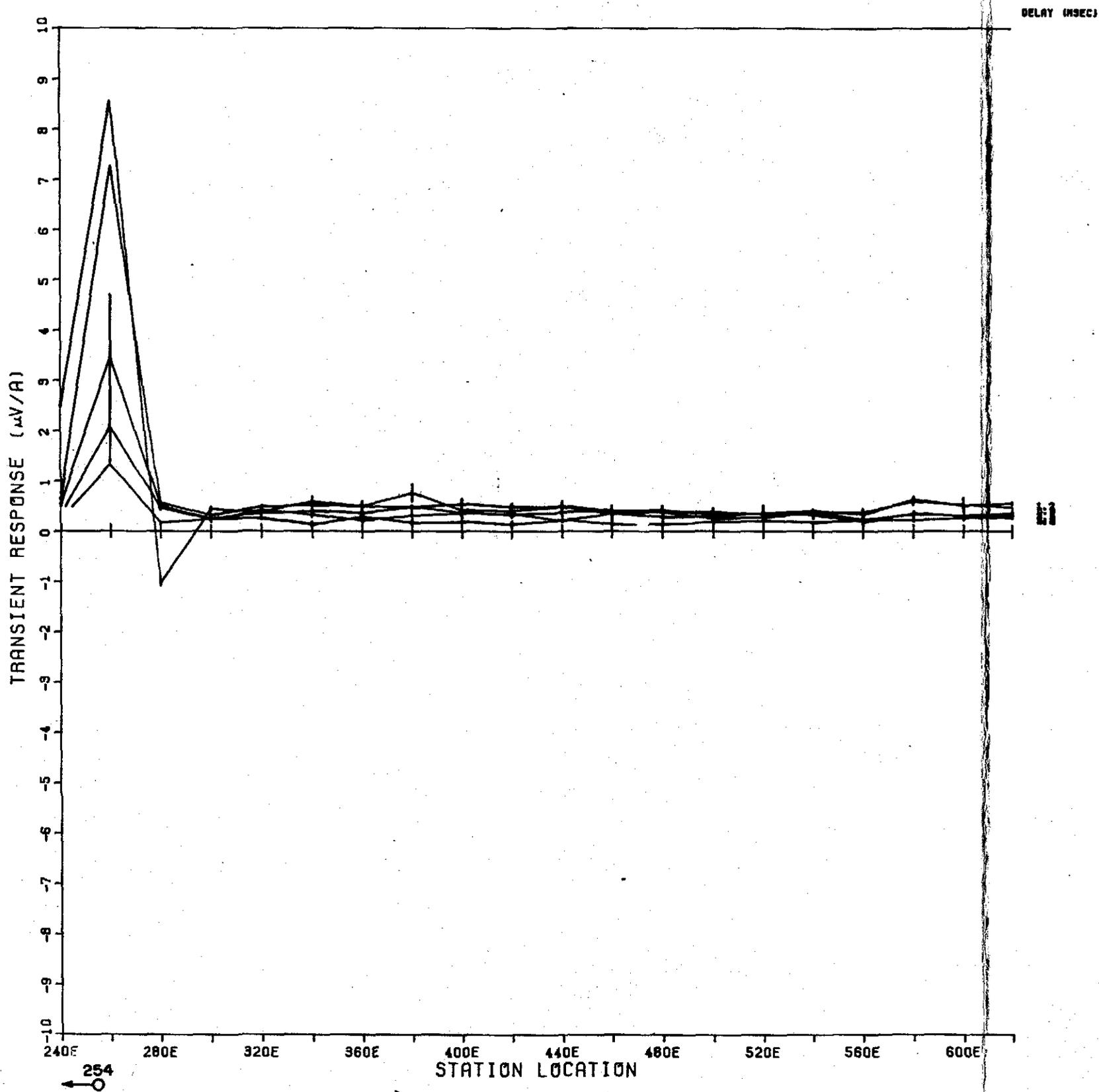

 GEOEX
 PTY LTD

FIG 11(a)

5 cm

023

291040



INSTRUMENT :SIROTEM
 CONFIGURATION:200M X 400M TRANSMITTER LOOP,
 TURAM MODE (AVA) SURVEY
 READING INTERVAL 20M

SCALE: 1:2000
 DATE: 5/2/82
 MAP: QUEENSTOWN, TAS.

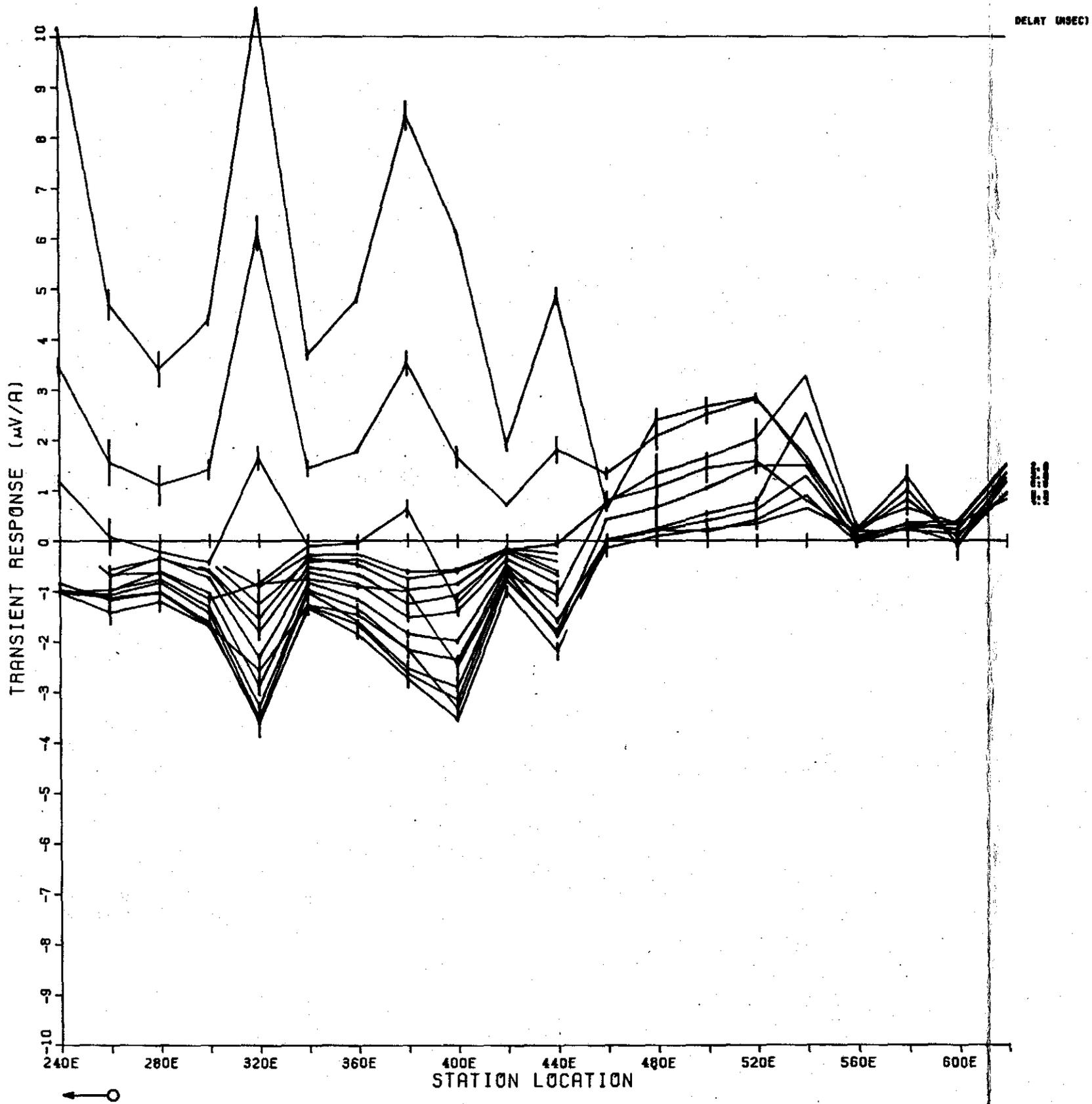
MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 6S. E-W COMP., PROSPECT RED HILLS

GEOEX
 PTY LTD

5 cm

025

291041



INSTRUMENT :SIATEM
 CONFIGURATION:200M X 400M TRANSMITTER LOOP,
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

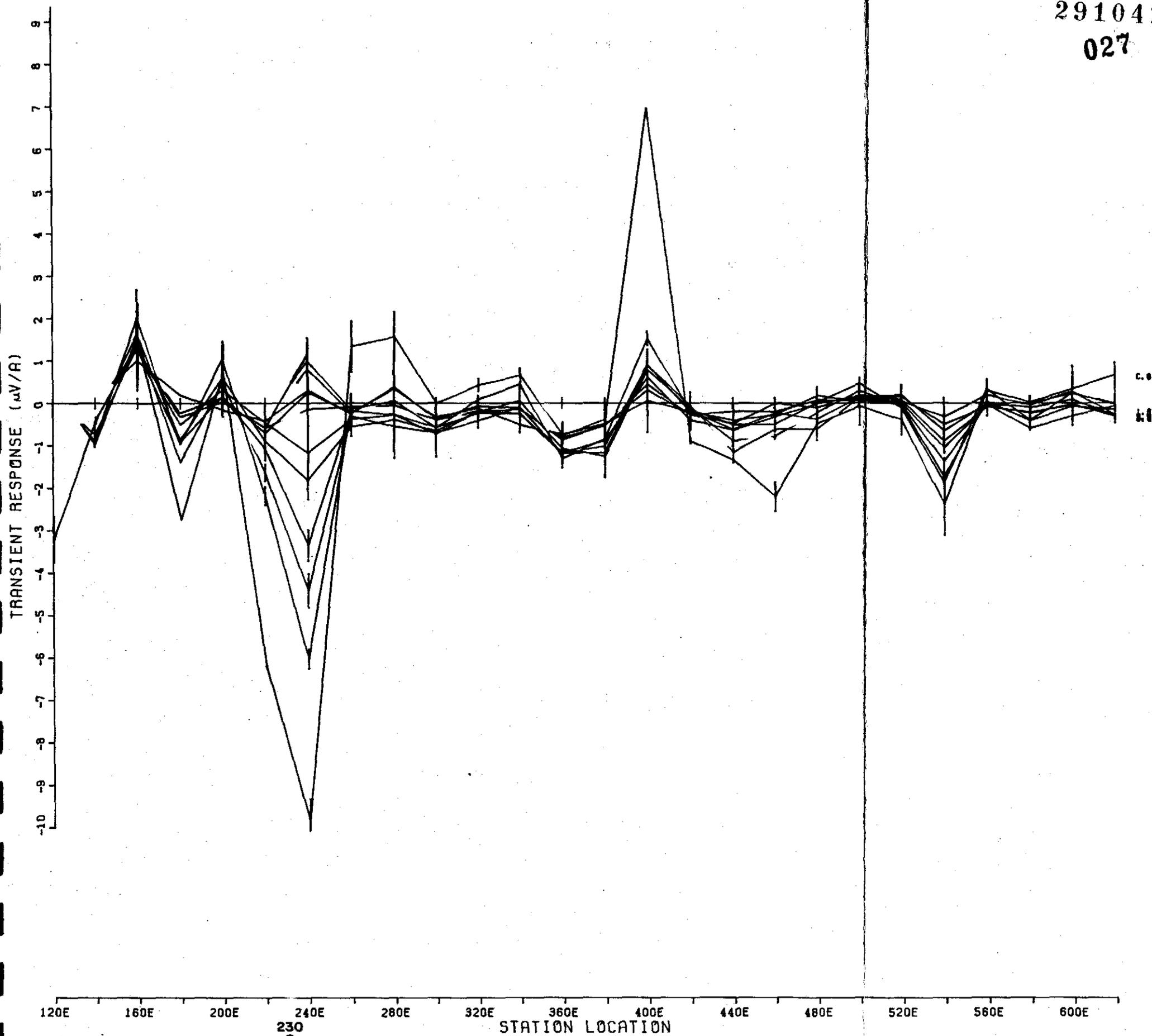
SCALE: 1:2000
 DATE : 6/2/82
 MAP : QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 8S, E-W COMP., PROSPECT RED HILLS



5 cm

FIG 116c



INSTRUMENT : SIROTEM
 CONFIGURATION : 200M X 400M TRANSMITTER LOOP, I-
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

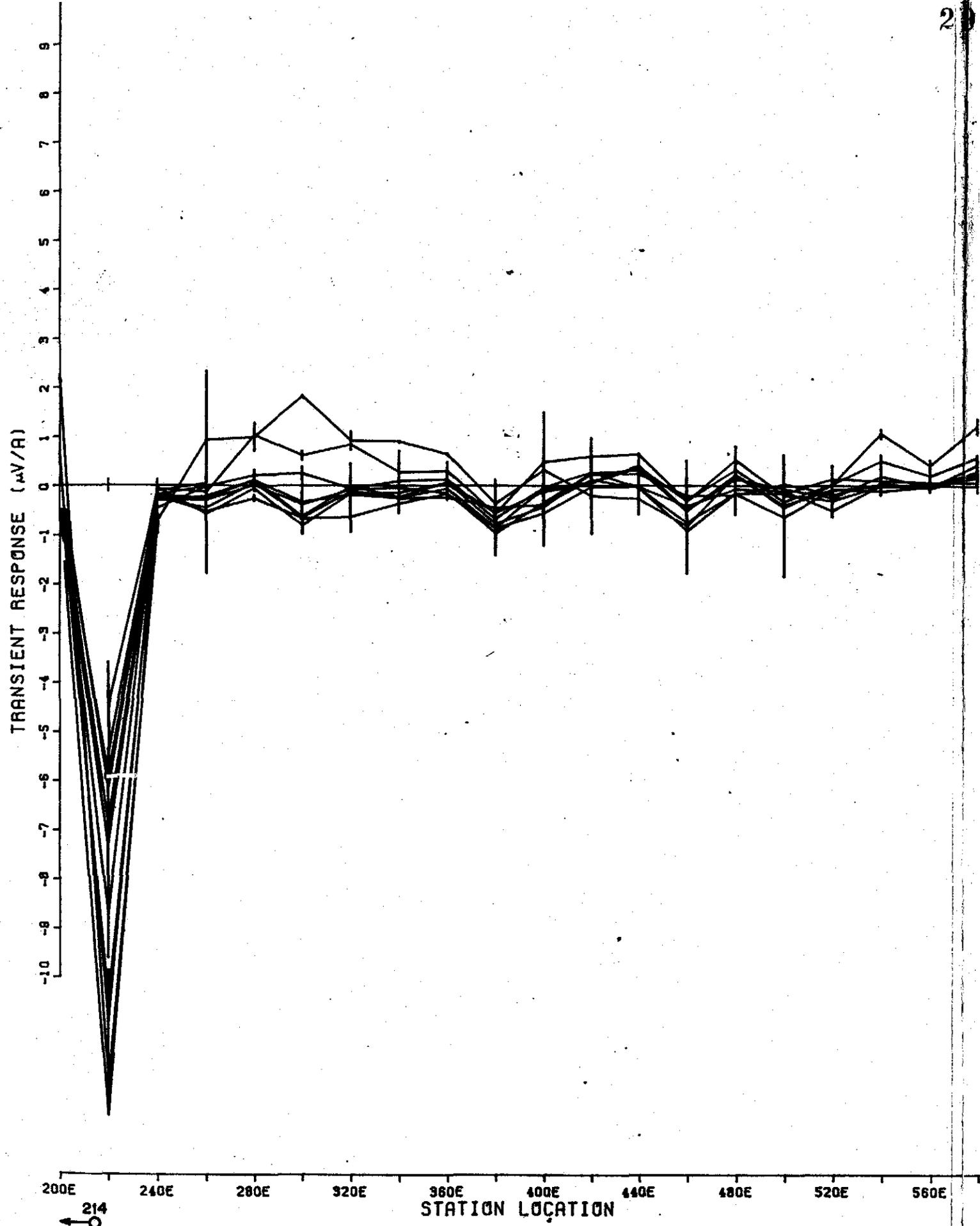
SCALE : 1:2000
 DATE : 7/2/82
 MAP : QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 10S, E-W COMP., PROSPECT RED HILLS



5 cm

FIG. 1(d)



200E 240E 280E 320E 360E 400E 440E 480E 520E 560E
 214
 STATION LOCATION

INSTRUMENT :SIROTEM
 CONFIGURATION:200M X 400M TRANSMITTER LOOP,
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

SCALE: 1:2000
 DATE: 7/2/82
 MAP: QUEENSTOWN, TAS.

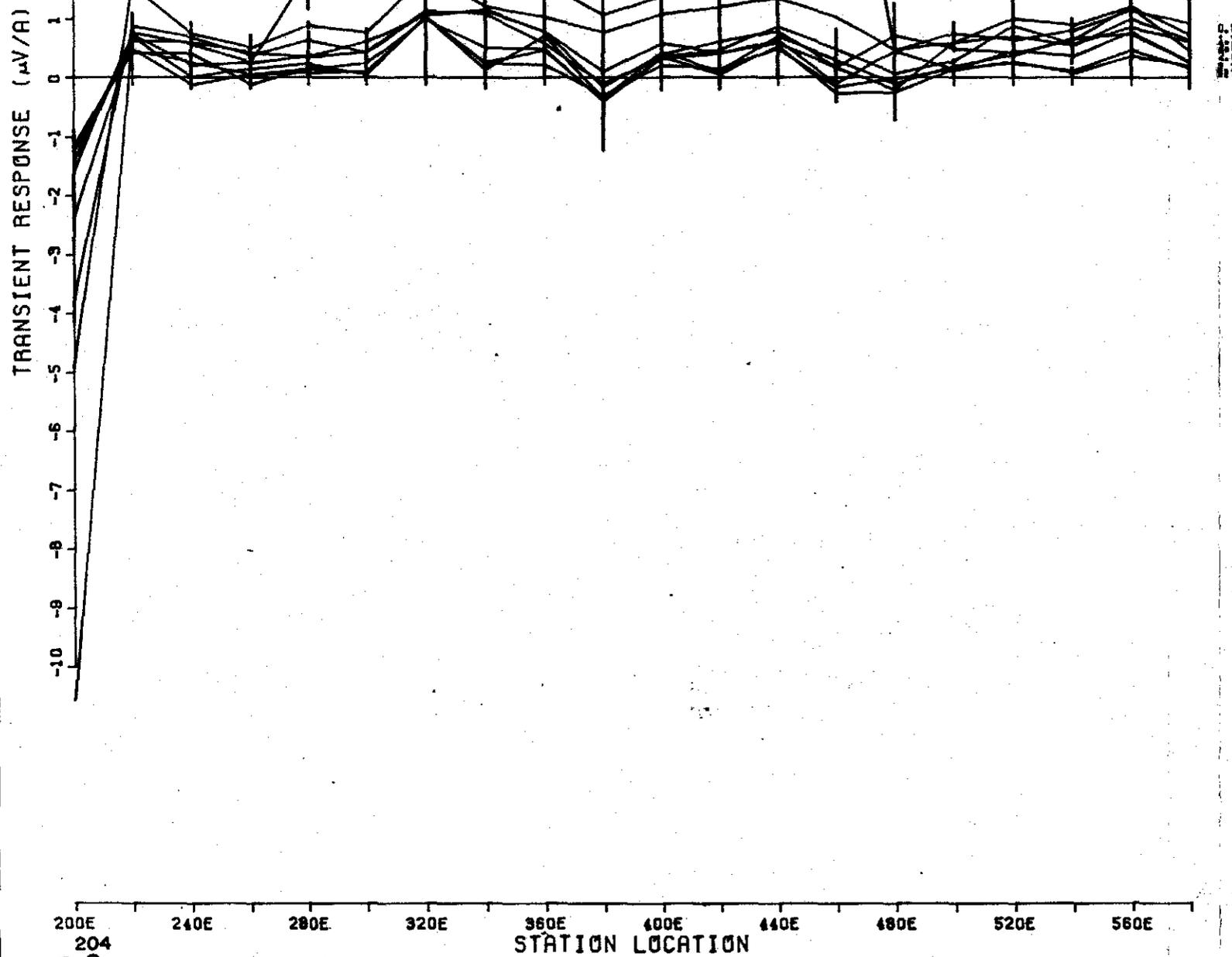
MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 12S, E-W COMP., PROSPECT RED HILLS



5 cm

031

291044



INSTRUMENT : SIROTEM
 CONFIGURATION : 200M X 400 M TRANSMITTER LOOP, 1
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

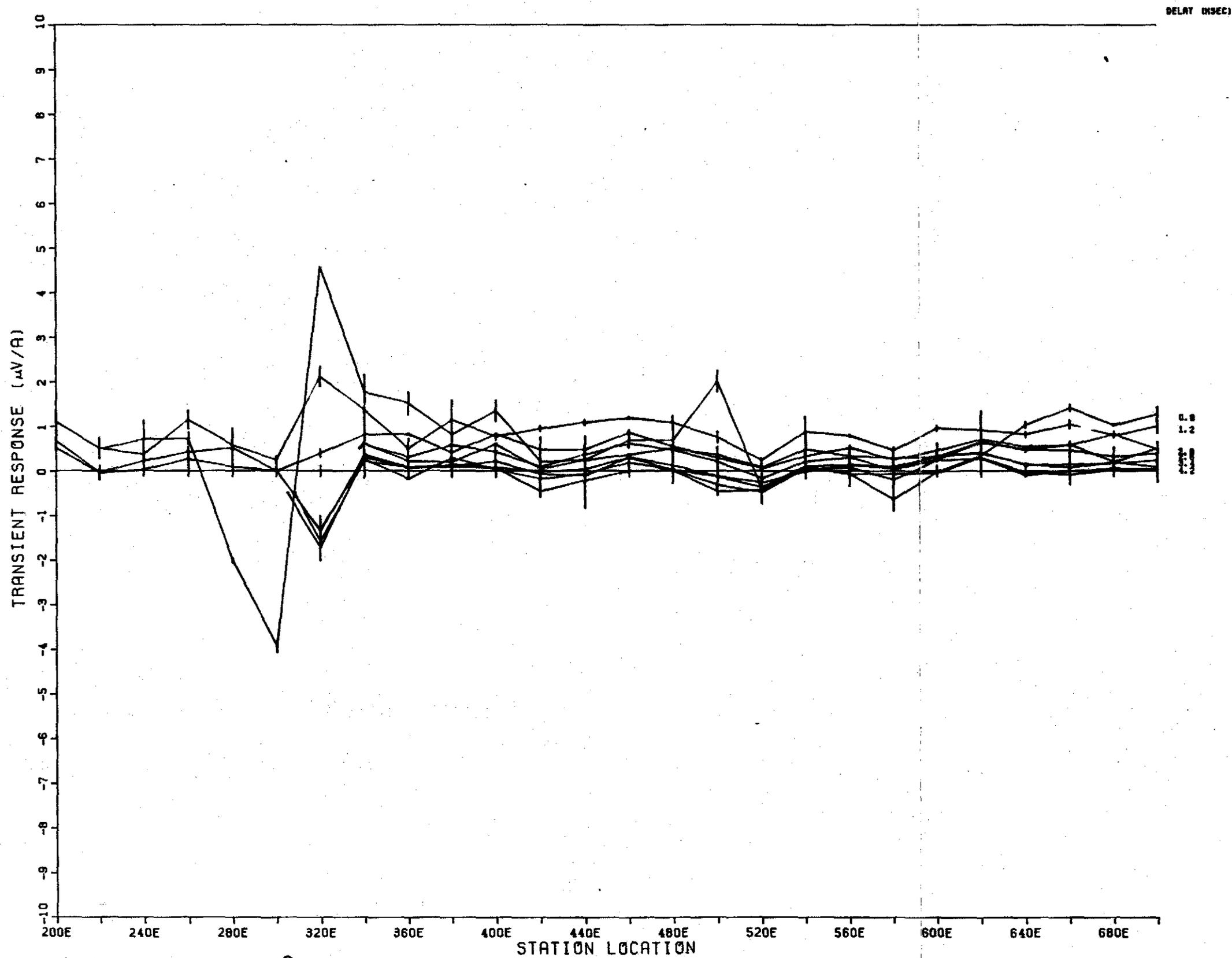
SCALE : 1:2000
 DATE : 8/2/82
 MAP : QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 14S, E-W COMP., PROSPECT RED HILLS



5 cm

FIG II(f)



INSTRUMENT :SIRTEM
 CONFIGURATION:200M X 400M TRANSMITTER LOOP,2
 TURAM MODE (AVA) SURVEY
 READING INTERVAL 20M

SCALE: 1:2000
 DATE: 10/2/82
 MAP: QUEENSTOWN, TAS.

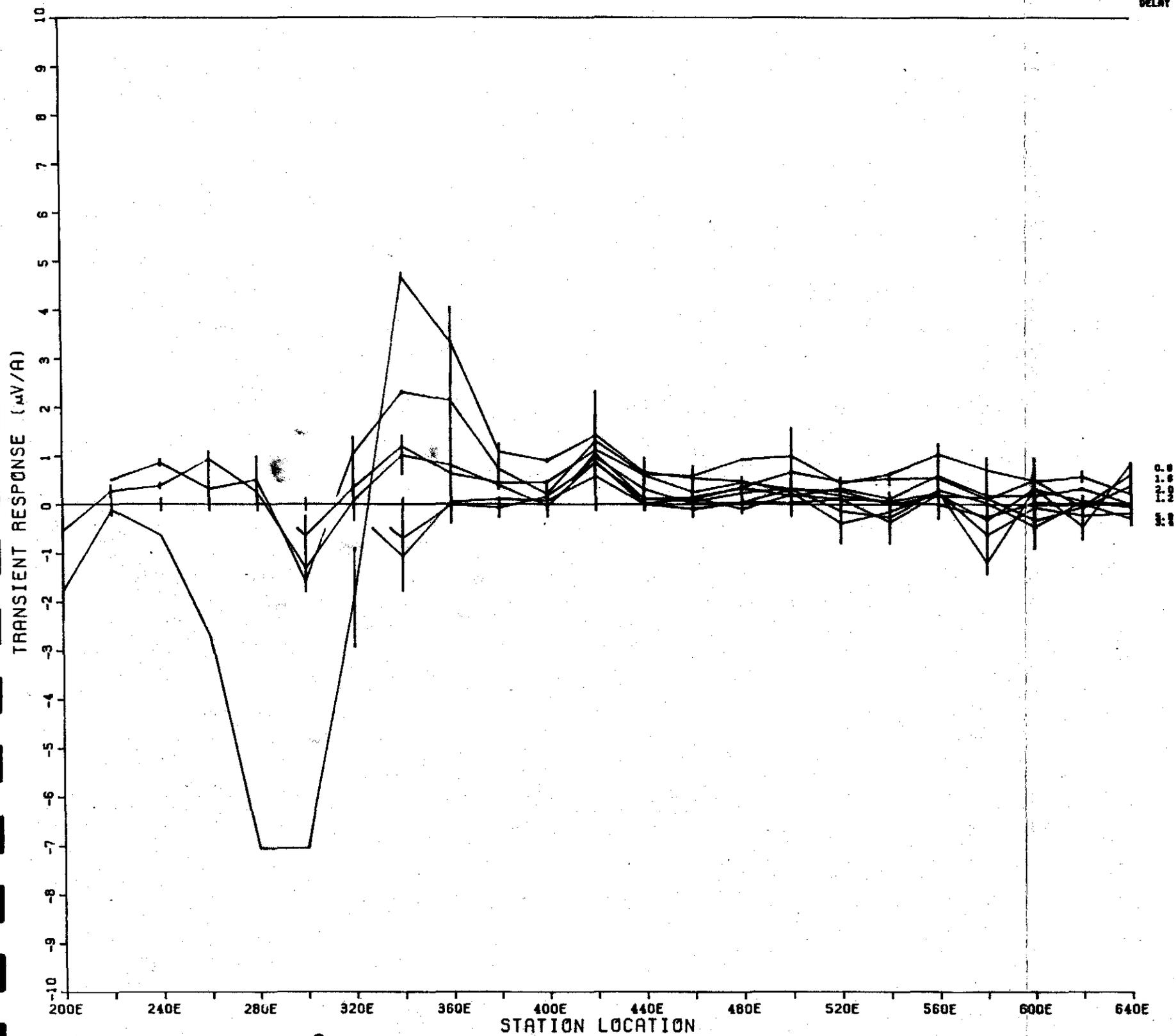
MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 16S.E-W COMP.. PROSPECT RED HILLS



FIG.11(g)

5 cm

DELAY (MSECS)



INSTRUMENT : SIROTEM
 CONFIGURATION : 200M X 400M TRANSMITTER LOOP, 2
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

SCALE : 1:2000
 DATE : 11/2/82
 MAP : QUEENSTOWN, TAS.

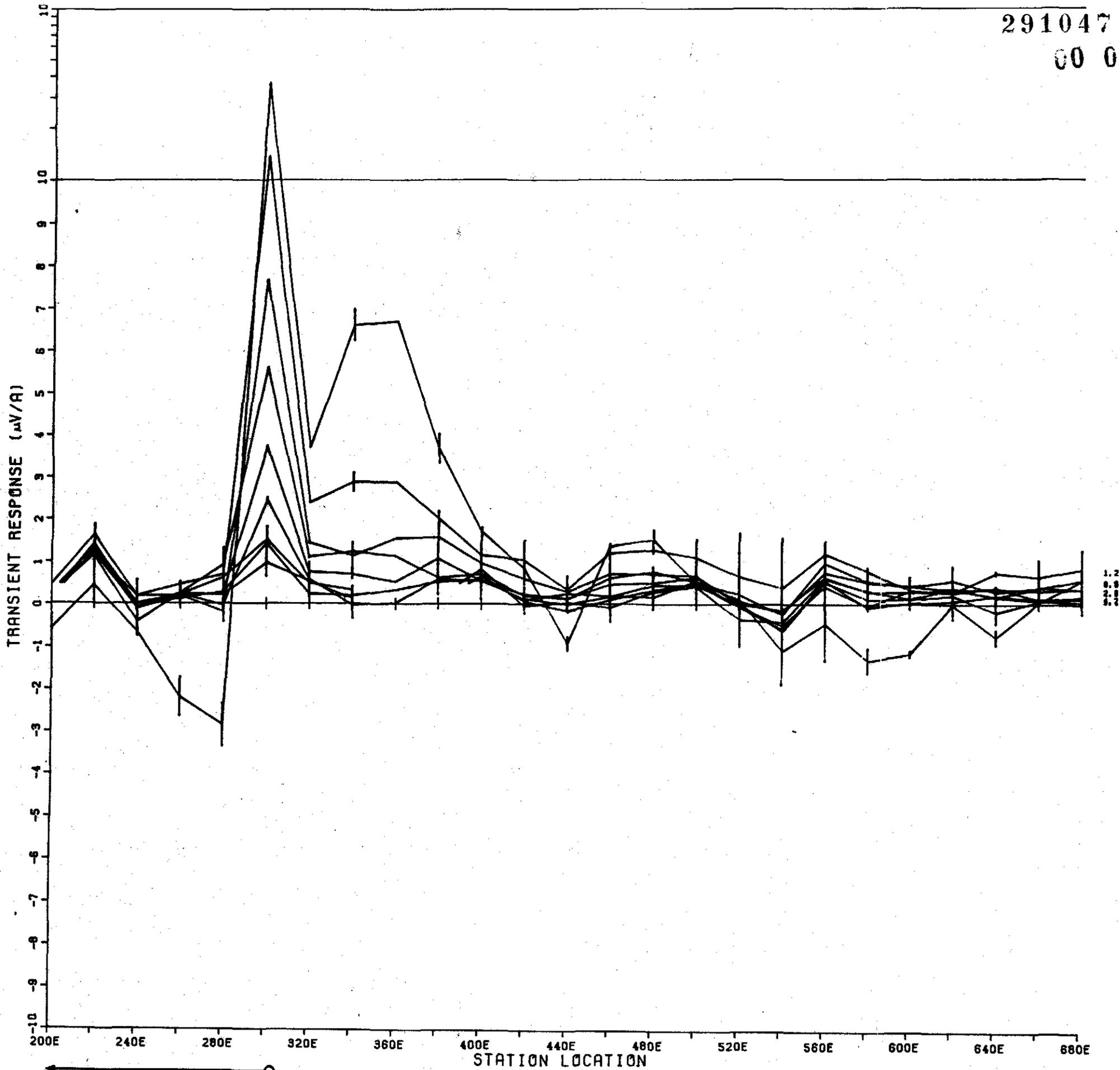
MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 18S, E-W COMP., PROSPECT RED HILLS



5 cm

FIG.11(h)

291047
00 037



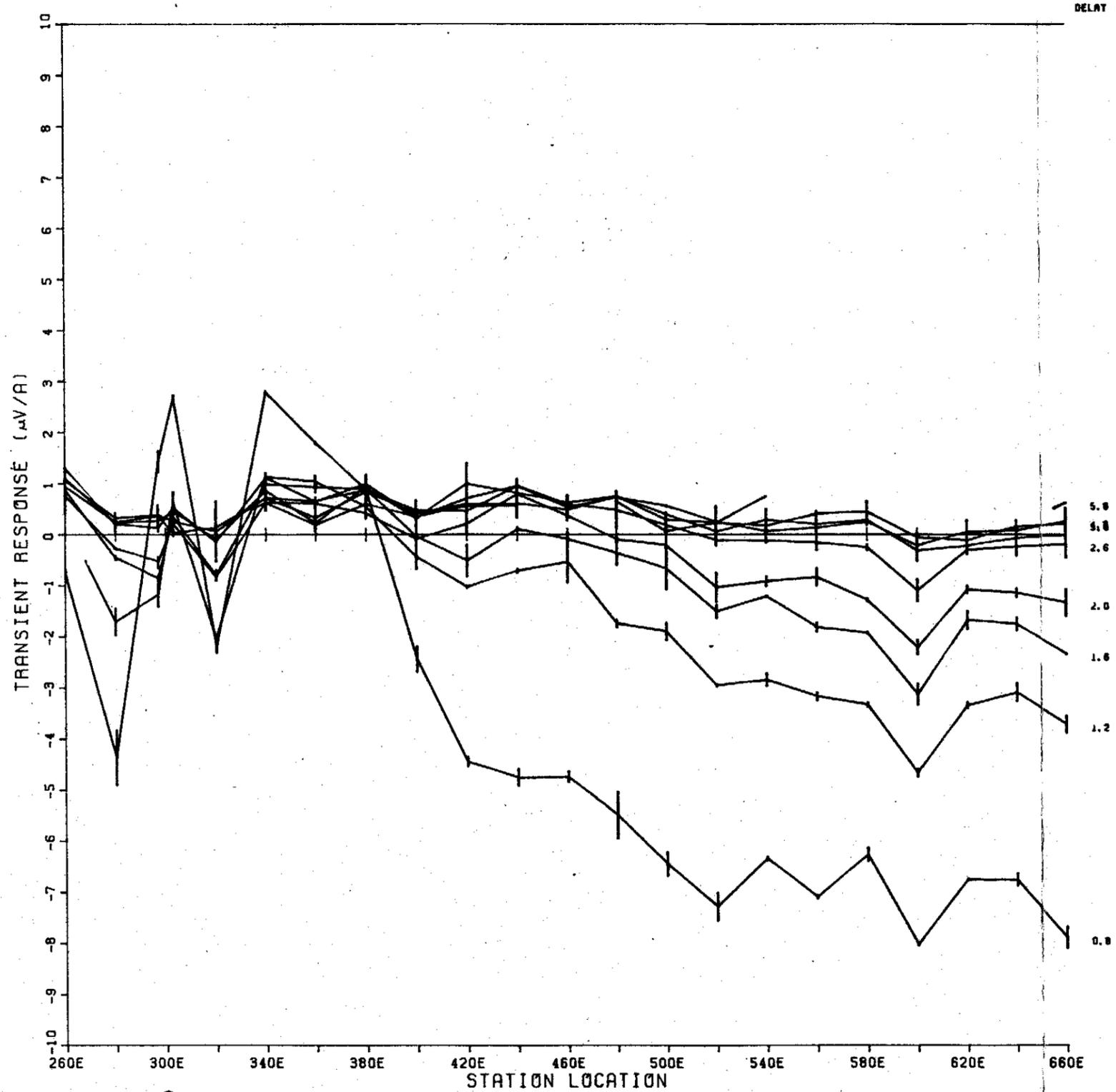
INSTRUMENT :SIROTEM
CONFIGURATION:200M X 400M TRANSMITTER LOOP,2
TURAM MODE (RVF) SURVEY
READING INTERVAL 20M

SCALE: 1:2000
DATE: 11/2/82
MAP: QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
TRANSIENT E.M. PROFILE
LINE 20S, E-W COMP., PROSPECT RED HILLS

GEOEX
PTY LTD

5 cm



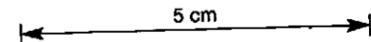
INSTRUMENT :SIR0TEM
 CONFIGURATION:200M X 400M TRANSMITTER LOOP,4
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

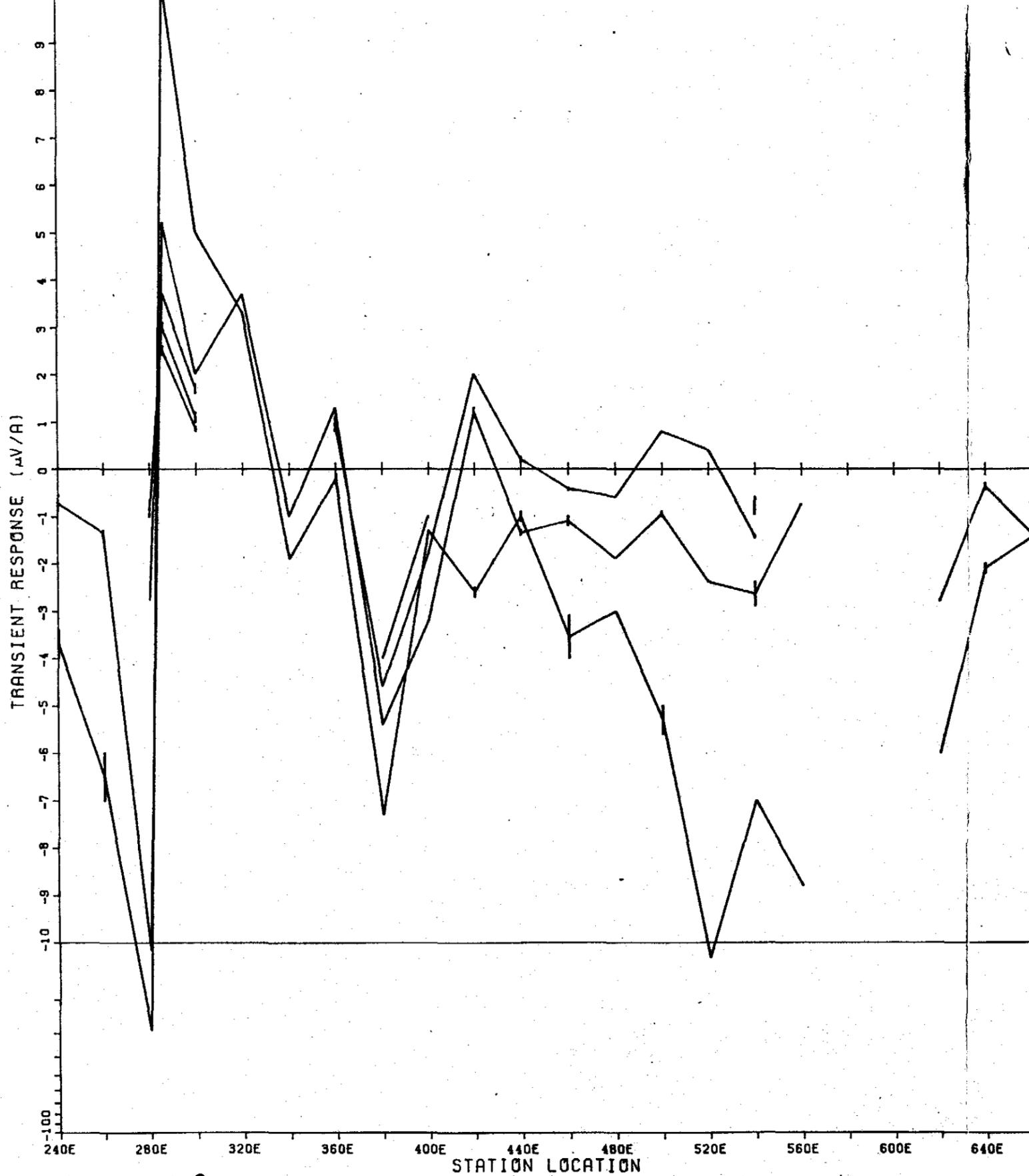
SCALE: 1:2000
 DATE : 9/4/82
 MAP : QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 22S. E-W COMP., PROSPECT RED HILLS



FIG.11(j)





91.5

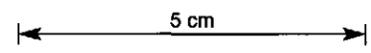
INSTRUMENT : SIROTEM
 CONFIGURATION : 200M X 400 M TRANSMITTER LOOP, 4
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

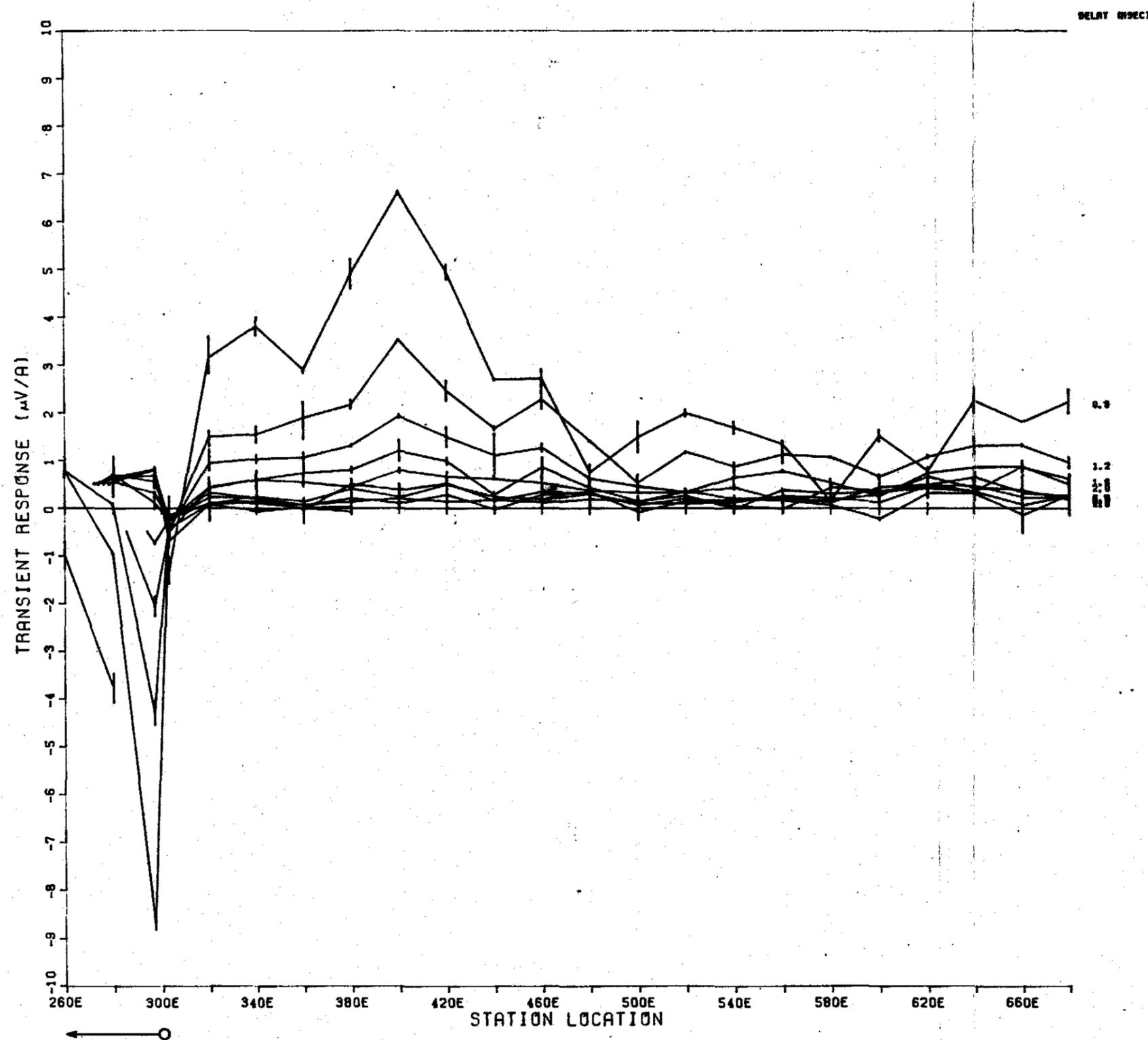
SCALE : 1:2000
 DATE : 9/4/82
 MAP : QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 24S, E-W COMP., PROSPECT RED HILLS



FIG 11(k)





INSTRUMENT : SIROTEM
 CONFIGURATION : 200M X 400M TRANSMITTER LOOP, 4
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

SCALE : 1:2000
 DATE : 6/4/82
 MAP : QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 26S, E-W COMP., PROSPECT RED HILLS

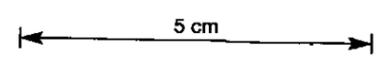
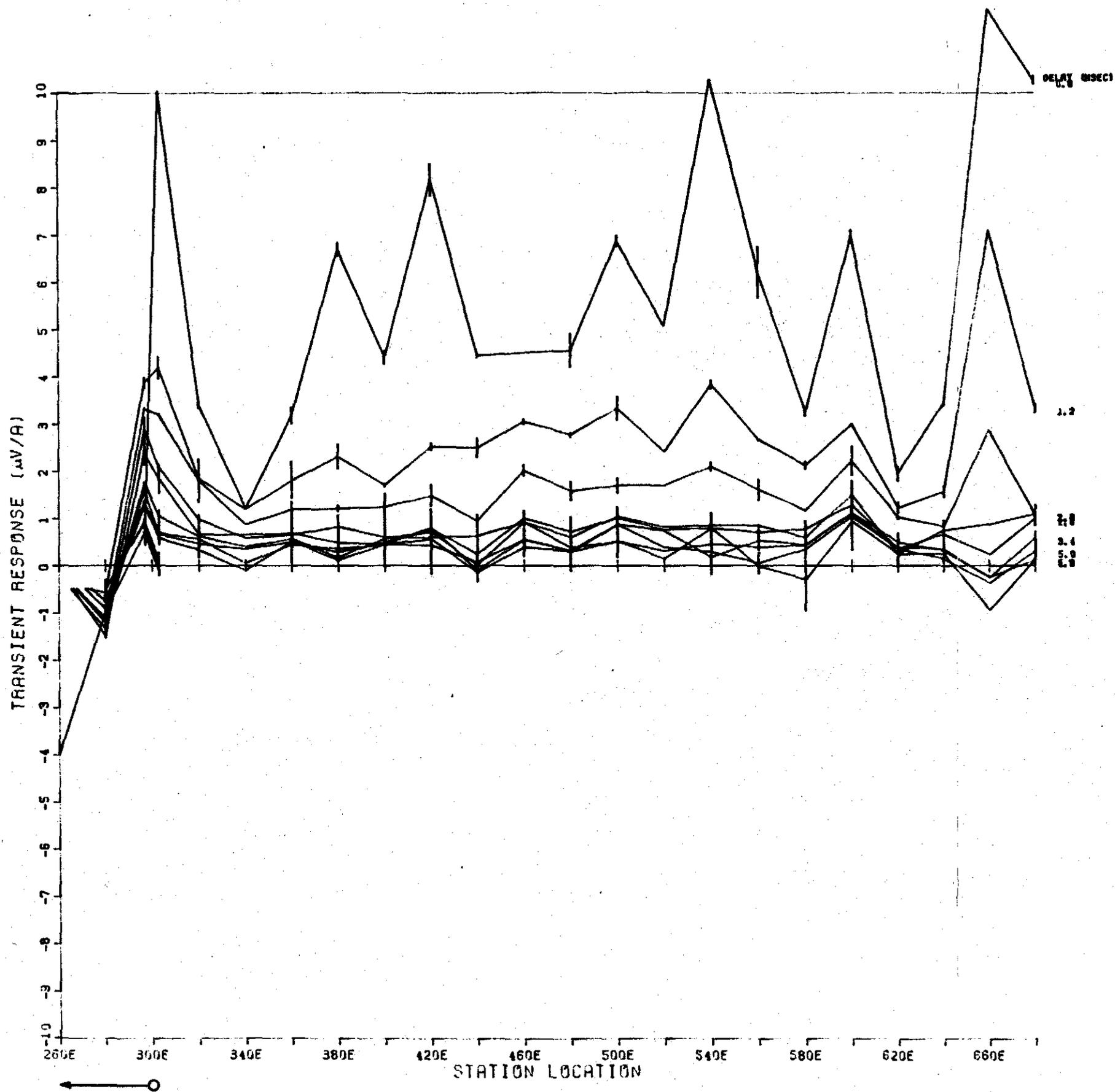


FIG.11(1)



INSTRUMENT : SIROTEH
 CONFIGURATION : 200M X 400M TRANSMITTER LOOP, 4
 TURN MADE (NVA) SURVEY
 HEADING INTERVAL 20M

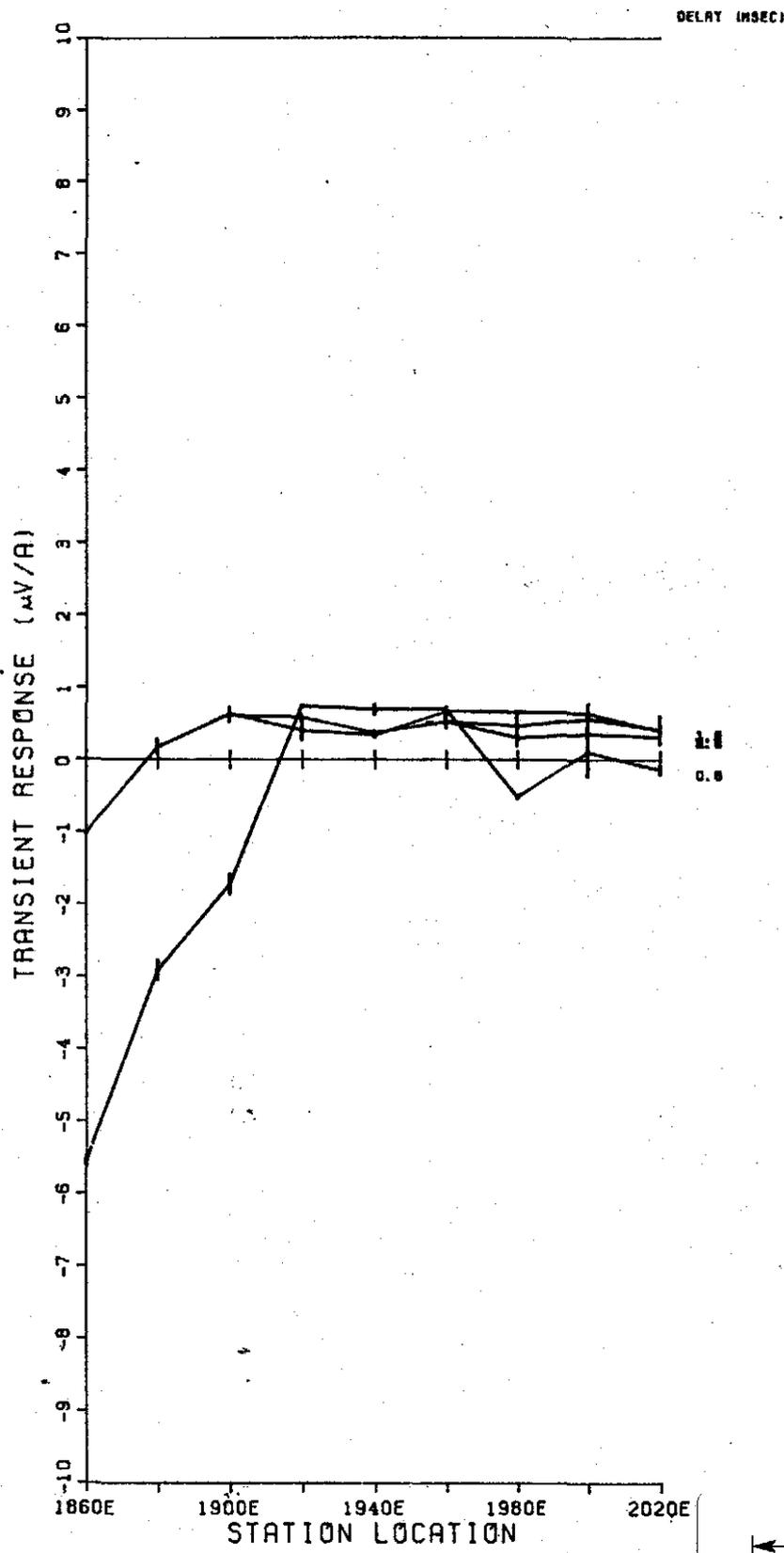
SCALE : 1:2000
 DATE : 1/4/62
 MAP : QUEENSTOWN, T.S.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 29S, E-W COMP., PROSPECT RED HILLS

GEDEX
 PTY LTD

5 cm

FIG 11(n)



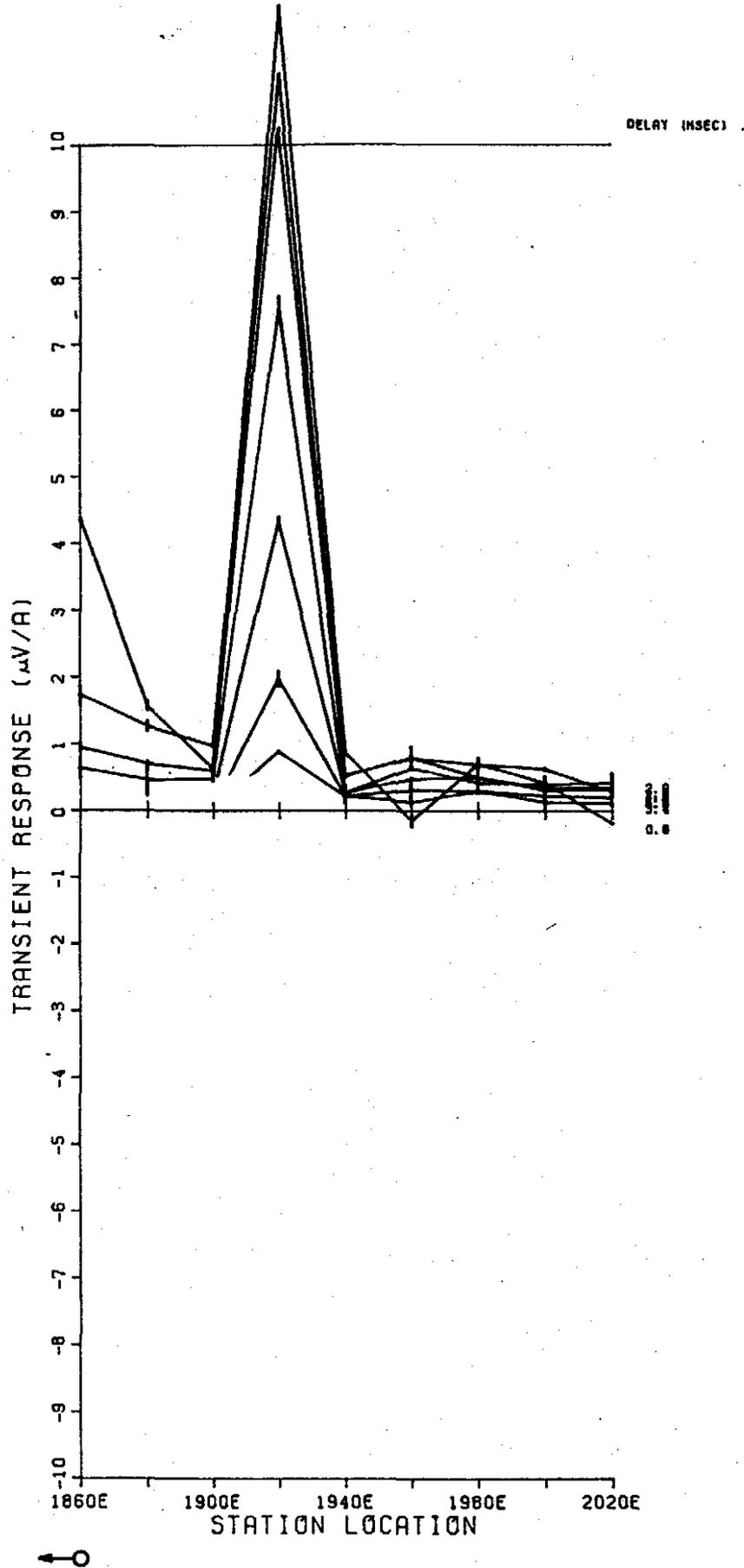
INSTRUMENT : SIROTEM
 CONFIGURATION: 200M X 400 M TRANSMITTER LOOP.2
 TURAM MODE (RVA) SURVEY
 READING INTERVAL 20M

SCALE: 1:2000
 DATE : 24/3/82
 MAP : QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 136S. VERT. COMP., PROSPECT DORA-SPICER



FIG. 36(a)



5 cm

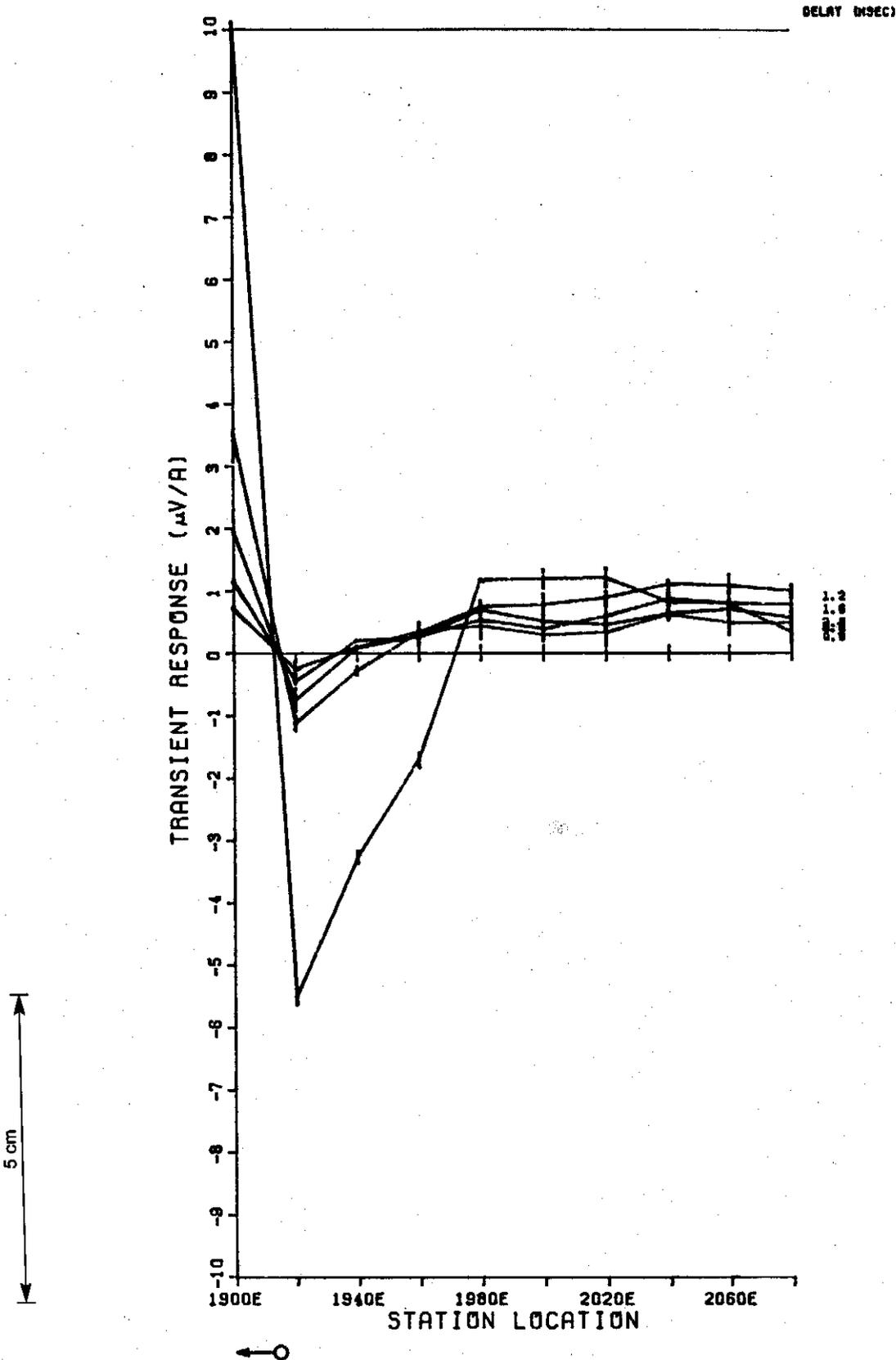
INSTRUMENT : SIROTEM
 CONFIGURATION: 200M X 400 M TRANSMITTER LOOP, 2
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

SCALE: 1:2000
 DATE: 24/3/82
 MAP: QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 136S, E-W COMP., PROSPECT DORA-SPICER



FIG.36(b)

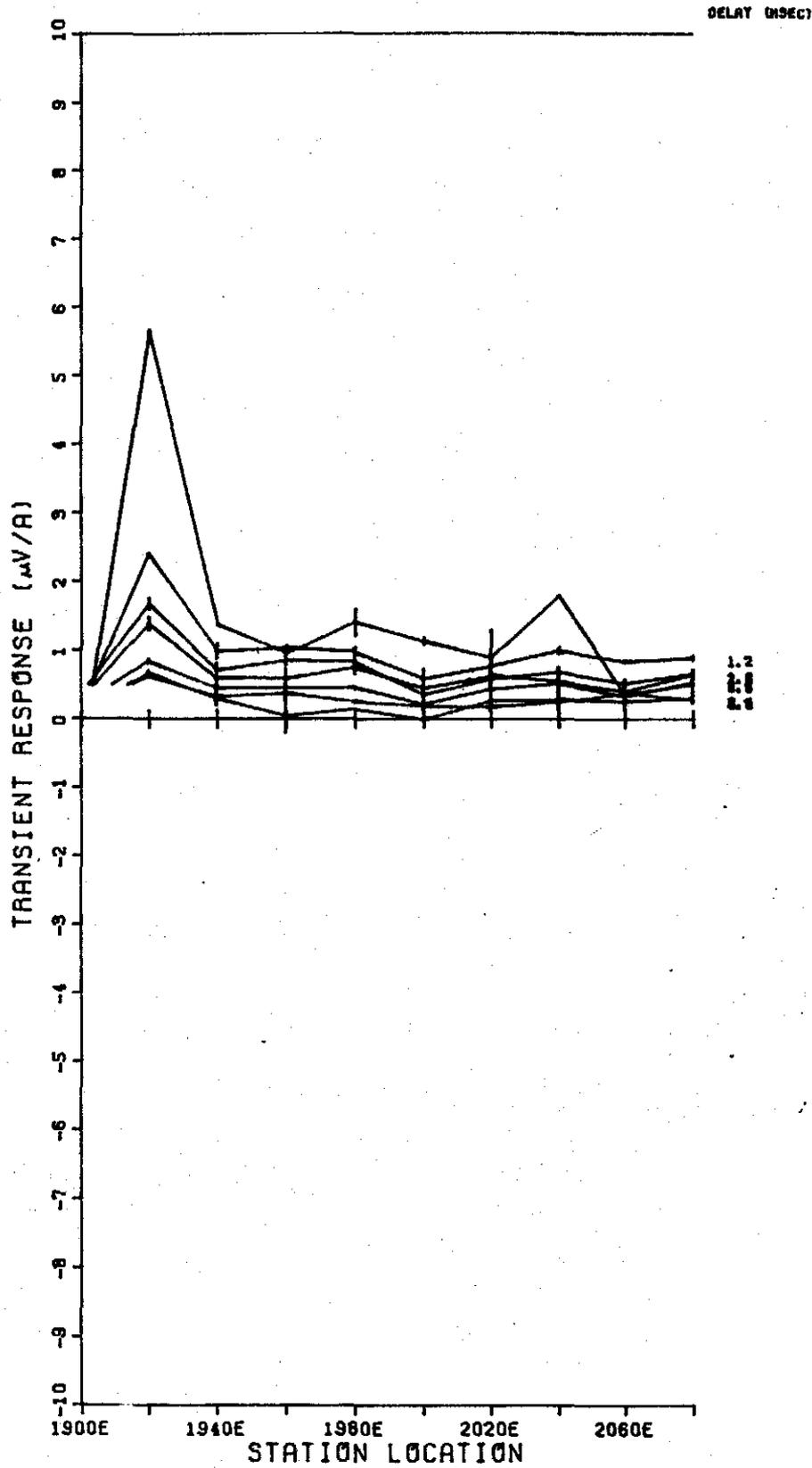


INSTRUMENT :SIROTEM
 CONFIGURATION:200M X 400M TRANSMITTER LOOP,2
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

SCALE: 1:2000
 DATE : 24/3/82
 MAP : QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 140S, PROSPECT DORA-SPICER
 VERTICAL COMP



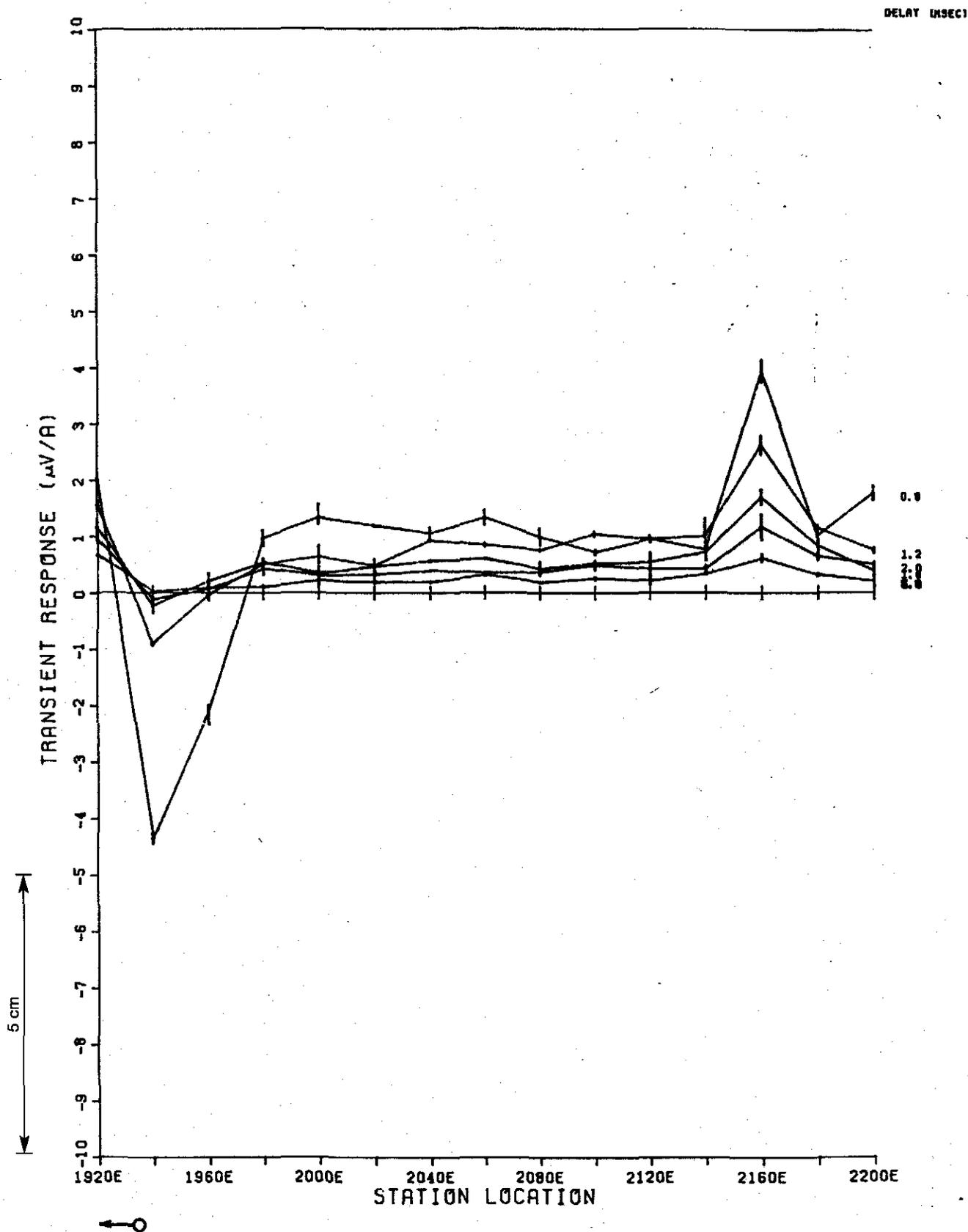


INSTRUMENT : SIROTEM
 CONFIGURATION: 200M X 400M TRANSMITTER LOOP, 2
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

SCALE: 1:2000
 DATE: 24/3/82
 MAP: QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 140S. PROSPECT DORA-SPICER
 F W COMP





INSTRUMENT : SIROTEM
CONFIGURATION: 200M X 400M TRANSMITTER LOOP, 2
TURAM MODE (AVR) SURVEY
READING INTERVAL 20M

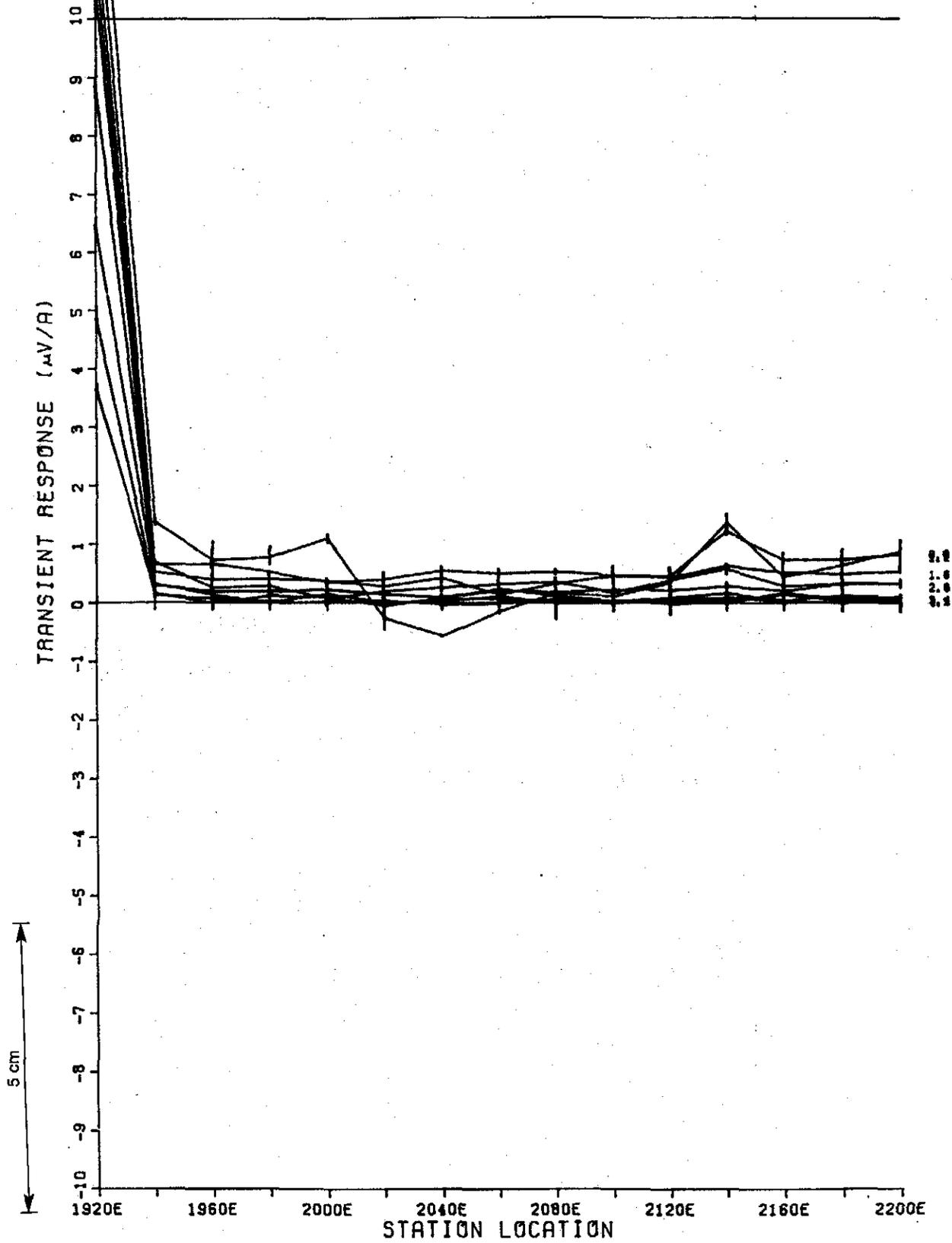
SCALE : 1:2000
DATE : 24/3/82
MAP : QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
TRANSIENT E.M. PROFILE
LINE 144S, PROSPECT DORA-SPICER
VERTICAL COMP



291057

057



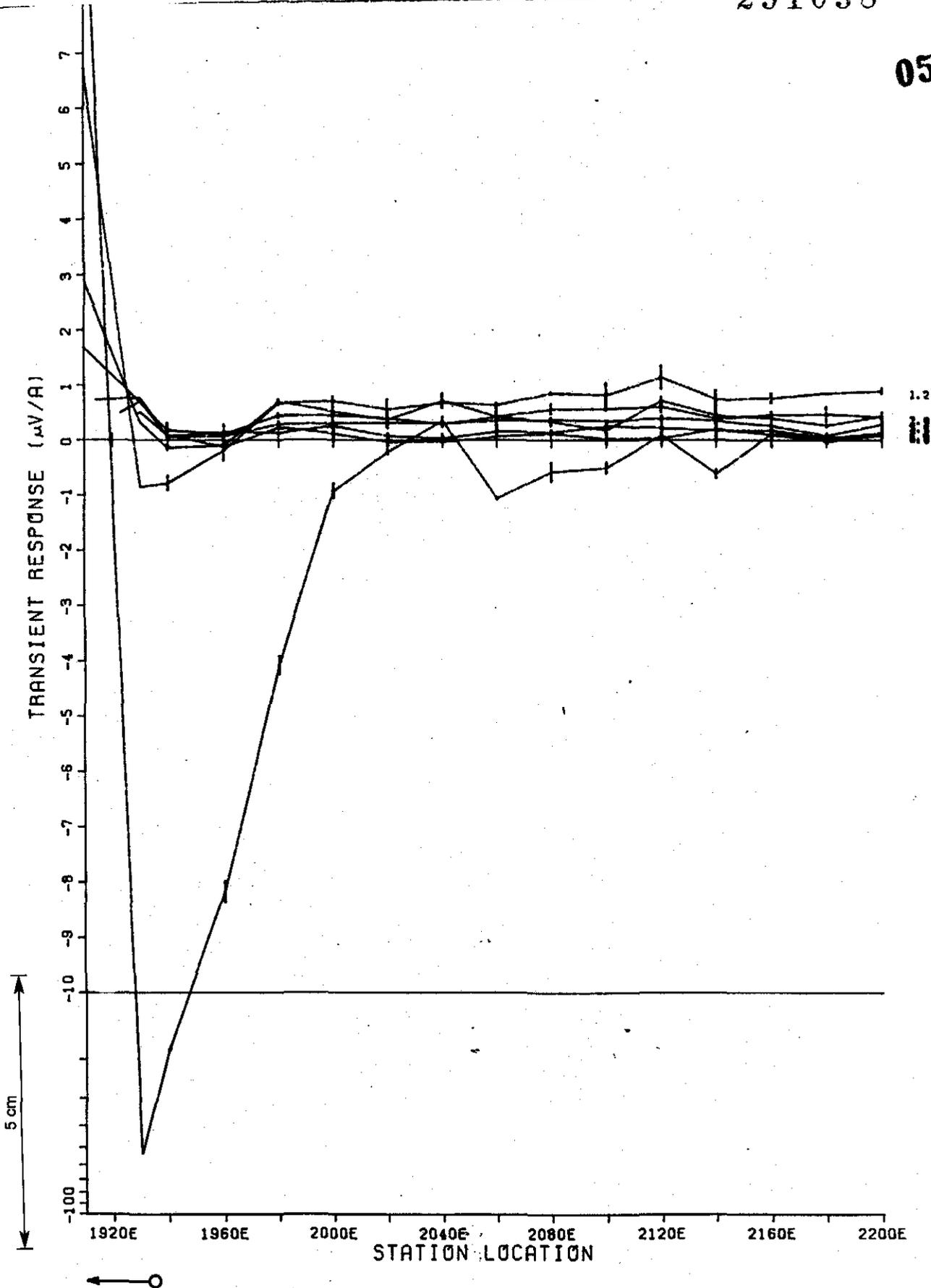
INSTRUMENT :SIRTEM
CONFIGURATION:200M X 400 M TRANSMITTER LOOP,2
TURAM MODE (AVR) SURVEY
READING INTERVAL 20M

SCALE: 1:2000
DATE : 24/3/82
MAP : QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
TRANSIENT E. M. PROFILE
LINE 144S, PROSPECT DORA-SPICER
E-W COMP



FIG.36f



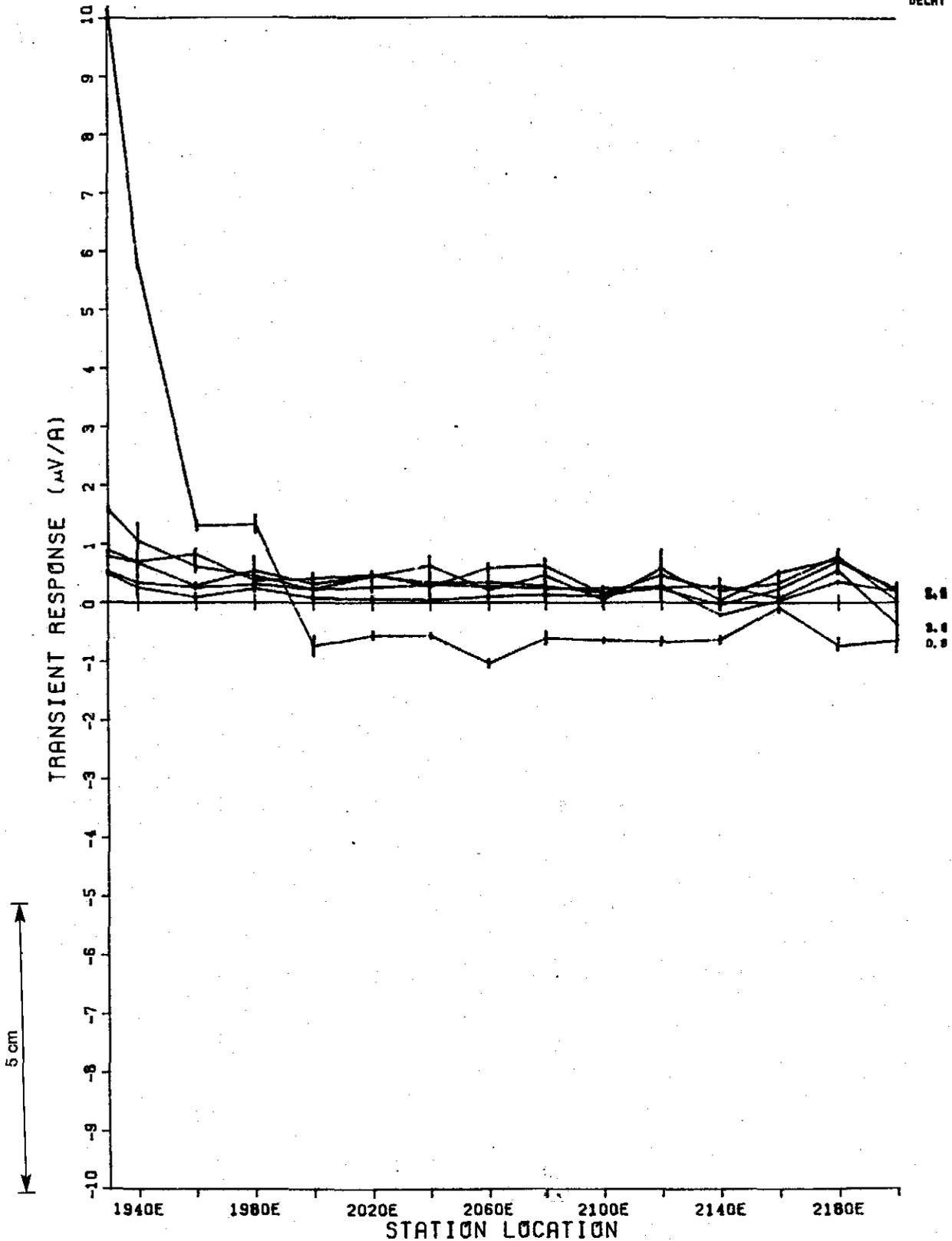
INSTRUMENT :SIRTEM
 CONFIGURATION:200M X 400 TRANSMITTER LOOP,2
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

SCALE : 1:2000
 DATE : 23/3/82
 MAP : QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 152S, PROSPECT DORA-SPICER
 VERTICAL COMP.



DELAY (MSEC)

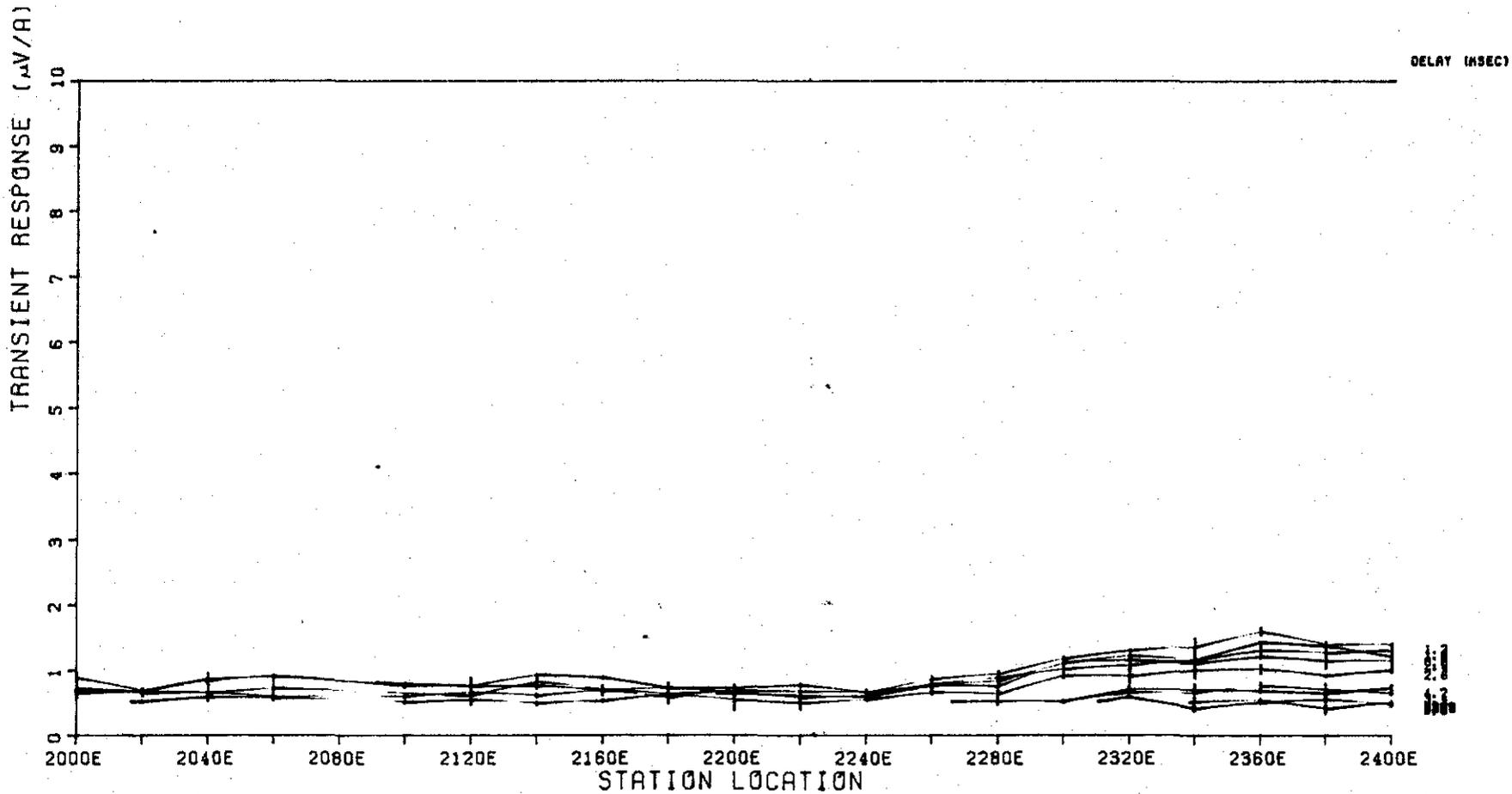


INSTRUMENT :SIADTEM
 CONFIGURATION:200M X 400M TRANSMITTER LOOP,2
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

SCALE : 1:2000
 DATE : 23/3/82
 MAP : QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 152S, PROSPECT DORA-SPICER
 E-W COMP





INSTRUMENT :SIROTEM
 CONFIGURATION:200M X400M TRANSMITTER LOOP,1
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

SCALE: 1:2000
 DATE : 15,17/2/82
 MAP : QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE

LINE 168S, VERTICAL COMP., PROSPECT DORA-SPICER

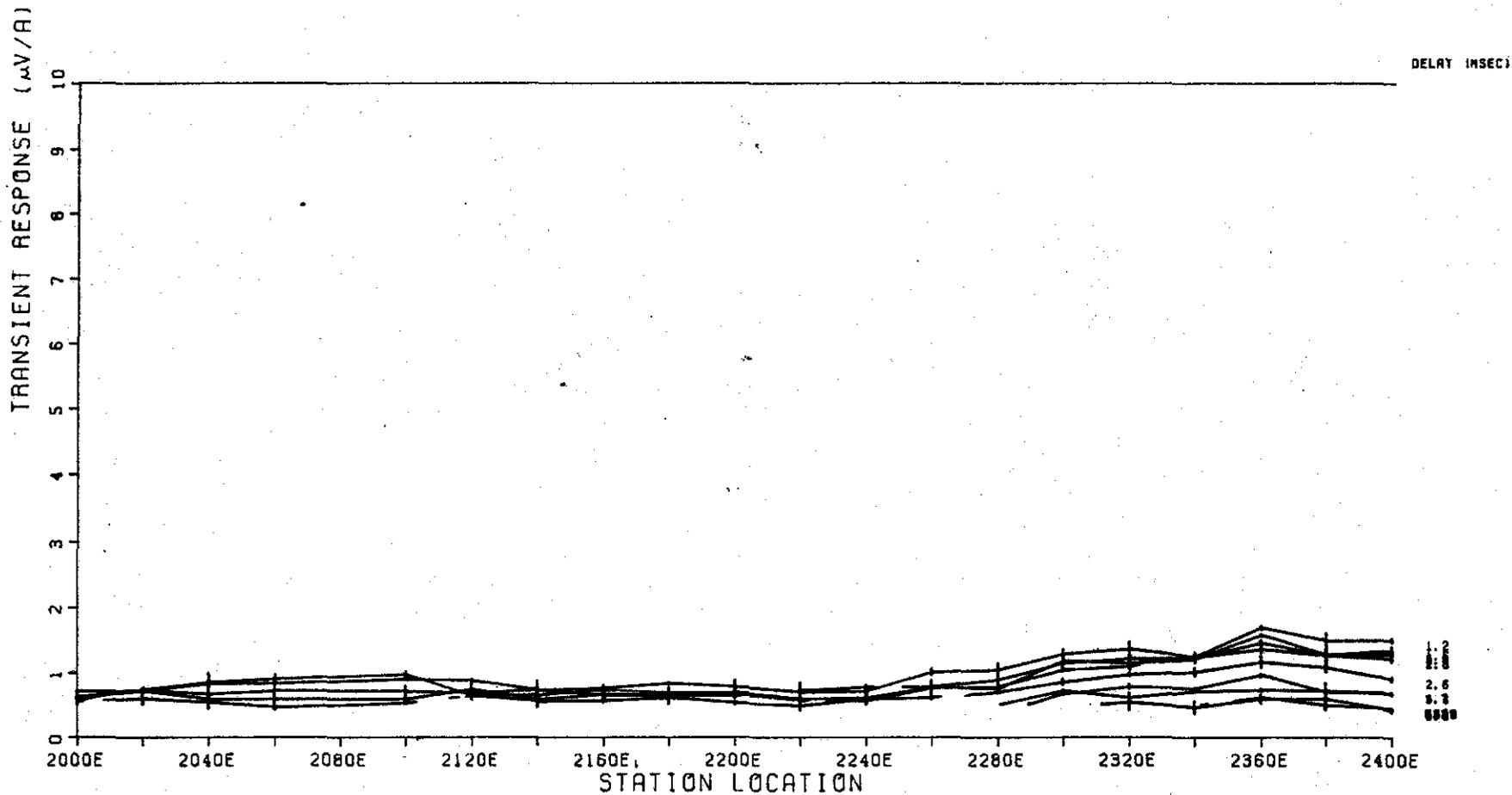


FIG 36(1)

060

201050

5 cm



INSTRUMENT : SIRTEM
 CONFIGURATION: 200M X 400 M TRANSMITTER LOOP, I
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

SCALE: 1:2000
 DATE: 15.17/2/82
 MAP: QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 168S, E-W COMP., PROSPECT DORA-SPICER



FIG 36(i)

291061

5 cm

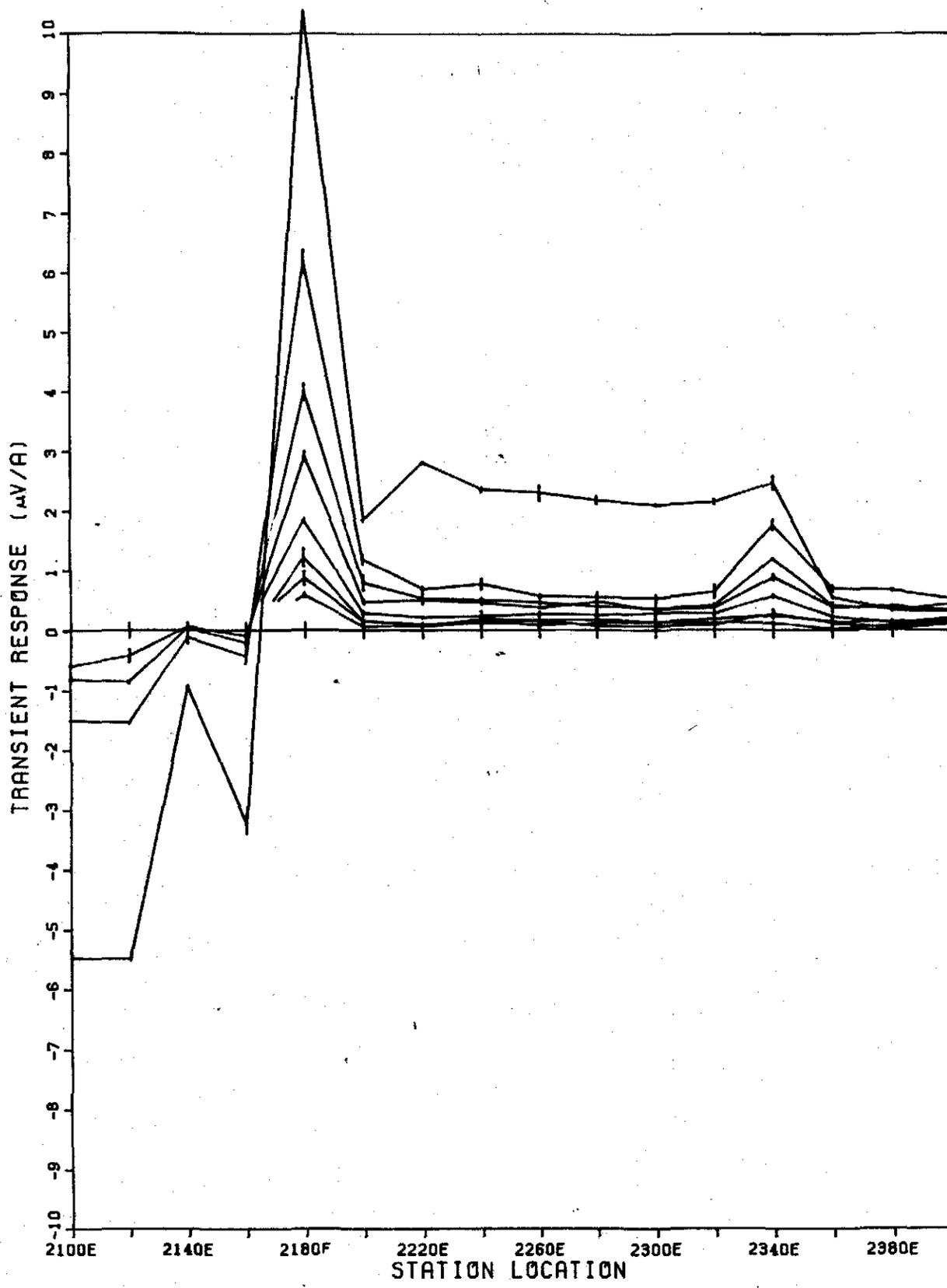
061

291062

062

5 cm

DELAY (MSEC)



INSTRUMENT :SIR0TEM
 CONFIGURATION:200M X 400M TRANSMITTER LOOP.1
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

SCALE: 1:2000
 DATE : 3/3/82
 MAP : QUEENSTOWN, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 176S, VERTICAL COMP., PROSPECT DORA-SPICER



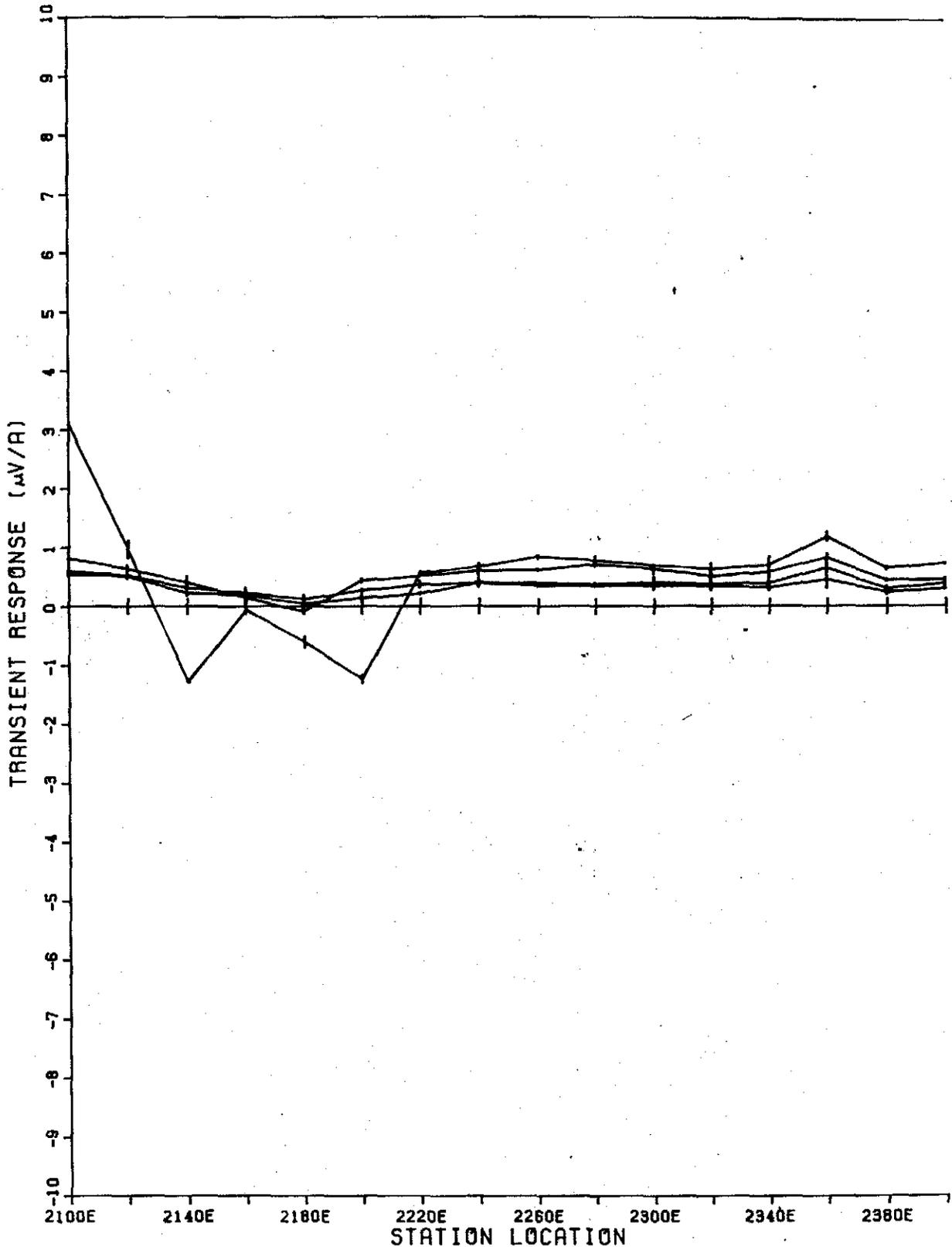
FIG.36(k)

291063

063

5 cm

DELAY (MSEC)



C. 0
A: 0

INSTRUMENT :SIROTEM
 CONFIGURATION:200M X 400M TRANSMITTER LOOP,
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

SCALE: 1:2000
 DATE : 3/3/82
 MAP : QUEENSTOWN, TAS.

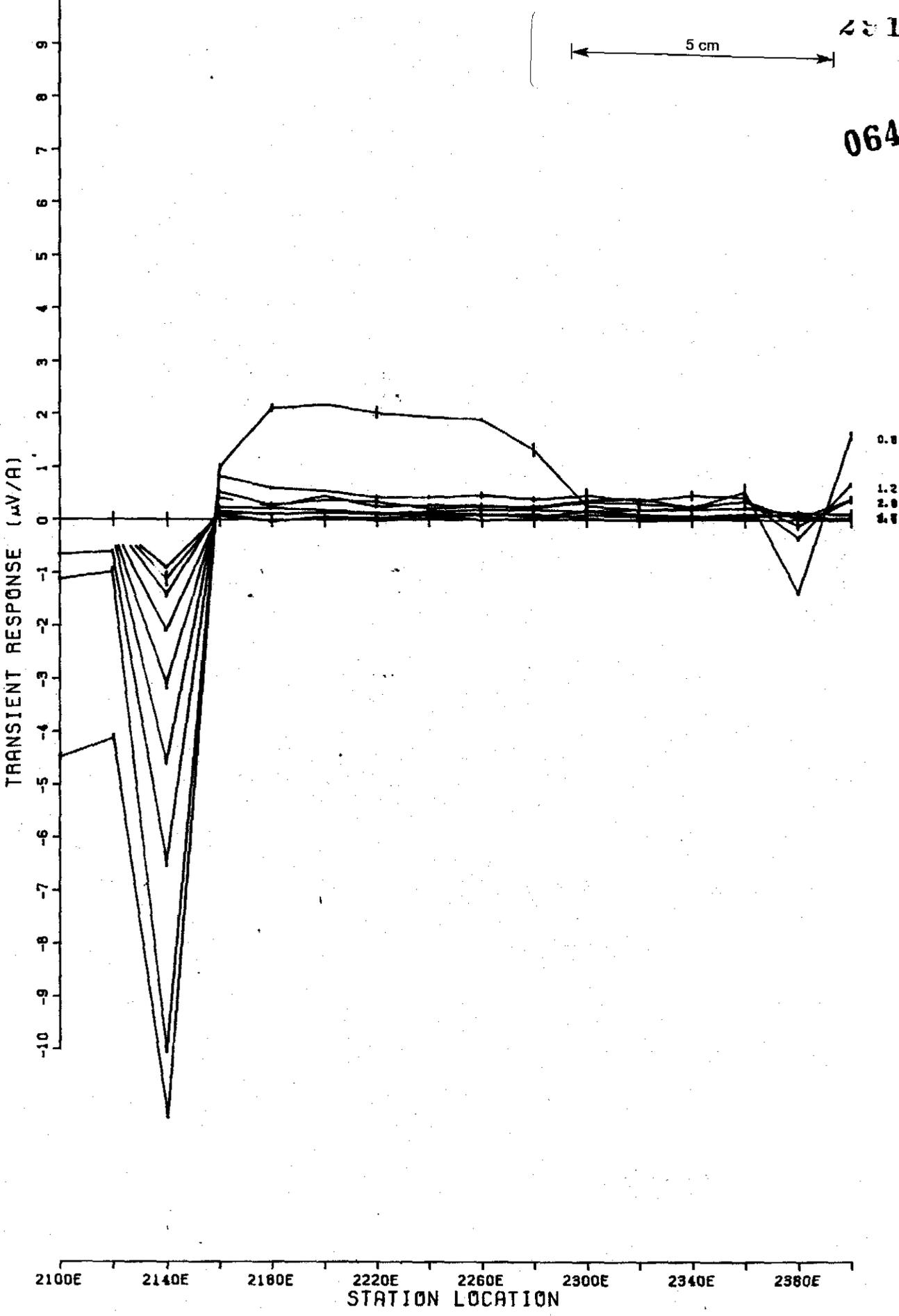
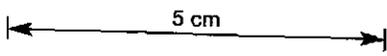
MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 176S.E-W COMP., PROSPECT DORA-SPICER



FIG.36(

281064

064



2100E 2140E 2180E 2220E 2260E 2300E 2340E 2380E



INSTRUMENT :SIROTEM
 CONFIGURATION:200M X 400M TRANSMITTER LOOP,
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

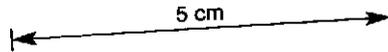
SCALE: 1:2000
 DATE : 3/3/82
 MAP : QUEENTOWNS, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE

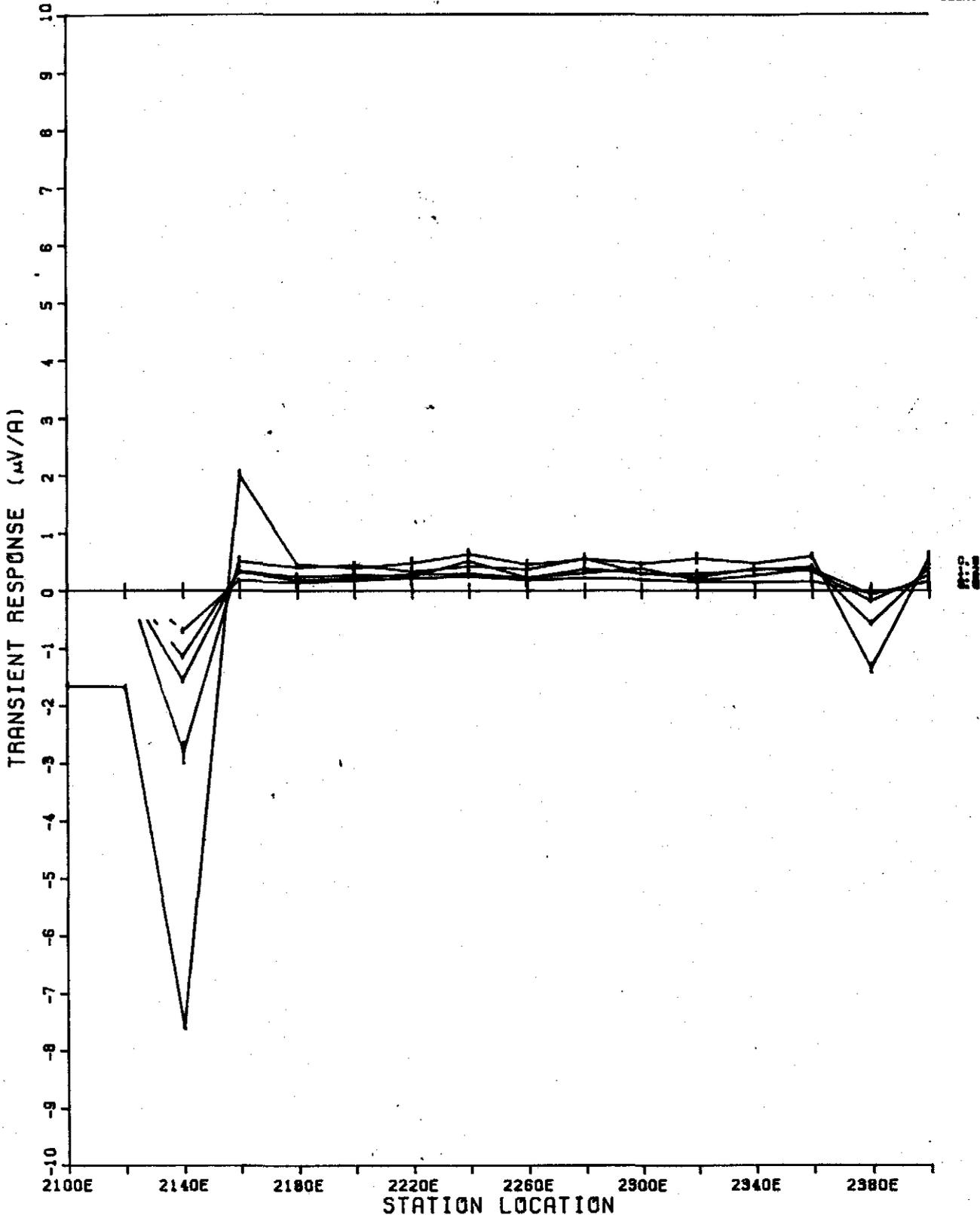
LINE 184S, VERTICAL COMP., PROSPECT DORA-SPICER



FIG.364



DELAY (MSEC)



INSTRUMENT :SIRGTEM
 CONFIGURATION:200M X 400 M TRANSMITTER LOOP, I
 TURAM MODE (AVR) SURVEY
 READING INTERVAL 20M

SCALE: 1:2000
 DATE : 3/3/82
 MAP : QUEENTOWNS, TAS.

MT. LYELL MINING AND RAILWAY CO. LTD.
 TRANSIENT E.M. PROFILE
 LINE 184S, E-W COMP., PROSPECT OORA-SPICER

