3822

MINING RECORDER
SEP 11 1972
KAMLOOPS, B.C.

92I/10E

REPORT ON THE
INDUCED POLARIZATION
AND RESISTIVITY SURVEY
ON THE
BEV CLAIM GROUP, CHERRY CREEK AREA,
KAMLOOPS MINING DIVISION, B.C.
FOR
TORWEST RESOURCES (1962) LTD. N.P.L.

BY

PHILIP G. HALLOF, Ph.D.

AND

MARION A. GOUDIE, B.Sc.

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO 3822 MAP

NAME AND LOCATION OF PROPERTY:

BEV CLAIM GROUP, CHERRY CREEK AREA, B.C.

KAMLOOPS MINING DIVISION, B.C. 50°39'30" N, 120°34' W

DATE STARTED: JUNE 19, 1972

DATE FINISHED: JULY 11, 1972

## McPHAR GEOPHYSICS

# NOTES ON THE THEORY, METHOD OF FIELD OPERATION AND PRESENTATION OF DATA FOR THE INDUCED POLARIZATION METHOD

Induced Polarization as a geophysical measurement refers to the blocking action or polarization of metallic or electronic conductors in a medium of ionic solution conduction.

This electro-chemical phenomenon occurs wherever electrical current is passed through an area which contains metallic minerals such as base metal sulphides. Normally, when current is passed through the ground, as in resistivity measurements, all of the conduction takes place through ions present in the water content of the rock, or soil, i.e. by ionic conduction. This is because almost all minerals have a much higher specific resistivity than ground water. The group of minerals commonly described as "metallic", however, have specific resistivities much lower than ground waters. The induced polarization effect takes place at those interfaces where the mode of conduction changes from ionic in the solutions filling the interstices of the rock to electronic in the metallic minerals present in the rock.

The blocking action or induced polarization mentioned above, which depends upon the chemical energies necessary to allow the ions to give up or receive electrons from the metallic surface, increases with the time that a d.c. current is allowed to flow through the rock; i.e. as ions pile up against the metallic interface the resistance to current flow increases. Eventually, there is enough polarization in the form of excess ions at the interfaces, to appreciably reduce the amount of current flow through the metallic particle. This polarization takes place at each of the infinite number of solution-metal interfaces in a mineralized rock.

When the d.c. voltage used to create this d.c. current flow is cut off, the Coulomb forces between the charged ions forming the polarization cause them to return to their normal position. This movement of charge creates a small current flow which can be measured on the surface of the ground as a decaying potential difference.

From an alternate viewpoint it can be seen that if the direction of the current through the system is reversed repeatedly before the polarization occurs, the effective resistivity of the system as a whole will change as the frequency of the switching is changed. This is a consequence of the fact that the amount of current flowing through each metallic interface depends upon the length of time that current has been passing through it in one direction.

The values of the per cent frequency effect or F. E. are a measurement of the polarization in the rock mass. However, since the measurement of the degree of polarization is related to the apparent resistivity of the rock mass it is found that the metal factor values or M. F. are the most useful values in determining the amount of polarization present in the rock mass. The MF values are obtained by normalizing the F. E. values for varying resistivities.

The induced polarization measurement is perhaps the most powerful geophysical method for the direct detection of metallic sulphide mineralization, even when this mineralization is of very low concentration. The lower limit of volume per cent sulphide necessary to produce a recognizable IP anomaly will vary with the geometry and geologic environment of the source, and the method of executing the survey. However, sulphide mineralization of less than one per cent by volume has been detected by the IP method under proper geological conditions.

The greatest application of the IP method has been in the search for disseminated metallic sulphides of less than 20% by volume. However, it has also been used successfully in the search for massive sulphides in situations where, due to source geometry, depth of source, or low resistivity of surface layer, the EM method can not be successfully applied. The ability to differentiate ionic conductors, such as water filled shear zones, makes the IP method a useful tool in checking EM anomalies which are suspected of being due to these causes.

In normal field applications the IP method does not differentiate between the economically important metallic minerals such as chalcopyrite, chalcocite, molybdenite, galena, etc., and the other metallic minerals such as pyrite. The induced polarization effect is due to the total of all electronic conducting minerals in the rock mass. Other electronic conducting materials which can produce an IP response are magnetite, pyrolusite, graphite, and some forms of hematite.

In the field procedure, measurements on the surface are made in a way that allows the effects of lateral changes in the properties of the ground to be separated from the effects of vertical changes in the properties. Current is applied to the ground at two points in distance (X) apart. The potentials are measured at two other points (X) feet apart, in line with the current electrodes is an integer number (n) times the basic distance (X).

The measurements are made along a surveyed line, with a constant distance (nX) between the nearest current and potential electrodes. In most surveys, several traverses are made with various values of (n); i.e. (n) = 1, 2, 3, 4, etc. The kind of survey required (detailed or reconnaissance) decides the number of values of (n) used.

In plotting the results, the values of the apparent resistivity, apparent per cent frequency effect, and the apparent metal factor measured for each set of electrode positions are plotted at the intersection of grid lines, one from the center point of the current electrodes and the other from the center point of the potential electrodes. (See Figure A.) The resistivity values are plotted above the line as a mirror image of the metal factor values below. On a second line, below the metal factor values, are plotted the values of the per cent frequency effect. In some cases the values of per cent frequency effect are plotted as superscripts of the metal factor value. In this second case the frequency effect values are not contoured. The lateral displacement of a given value is determined by the location along the survey line of the center point between the current and potential electrodes. The distance of the value from the line is determined by the distance (nX) between the current and potential electrodes when the measurement was made.

The separation between sender and receiver electrodes is only one factor which determines the depth to which the ground is being sampled in any particular measurement. The plots then, when contoured, are not section maps of the electrical properties of the ground under the survey line. The interpretation of the results from any given survey must be carried out using the combined experience gained from field results, model study results and theoretical investigations. The position of the electrodes when anomalous values are measured is important in the interpretation.

In the field procedure, the interval over which the potential differences are measured is the same as the interval over which the electrodes are moved after a series of potential readings has been made. One of the advantages of the induced polarization method is that the same equipment can be used for both detailed and reconnaissance surveys merely by changing the distance (X) over which the electrodes are moved each time. In the past, intervals have been used ranging from 25 feet to 2000 feet for (X). In each case, the decision as to the distance (X) and the values of (n) to be used is largely determined by the expected size of the mineral deposit being sought, the size of the expected anomaly and the speed with which it is desired to progress.

The diagram in Figure A demonstrates the method used in plotting the results. Each value of the apparent resistivity, apparent metal factor, and apparent per cent frequency effect is plotted and identified by the position of the four electrodes when the measurement was made. It can be seen that the values measured for the larger values of (n) are plotted farther from the line indicating that the thickness of the layer of the earth that is being tested is greater than for the smaller values of (n); i.e. the depth of the measurement is increased. When the F.E. values are plotted as superscripts to the MF values the third section of data values is not presented and the F.E. values are not contoured.

The actual data plots included with the report are prepared utilizing an IBM 360/75 Computer and a Calcomp 770/763 Incremental Plotting System. The data values are calculated, plotted, and contoured according to a programme developed by McPhar Geophysics. Certain symbols have been incorporated into the programme to explain various situations in recording the data in the field.

The IP measurement is basically obtained by measuring the difference in potential or voltage ($\Delta V$) obtained at two operating frequencies. The voltage is the product of the current through the ground and the apparent resistivity of the ground. Therefore in field situations where the current is very low due to poor electrode contact, or the apparent resistivity is very low, or a combination of the two effects; the value of ($\Delta V$) the change in potential will be too small to be measurable. The symbol "TL" on the data plots indicates this situation.

In some situations spurious noise, either man made or natural, will render it impossible to obtain a reading. The symbol "N" on the data plots indicates a station at which it is too noisey to record a reading. If a reading can be obtained, but for reasons of noise there is some doubt as to its accuracy, the reading is bracketed in the data plot ( ).

In certain situations negative values of Apparent Frequency Effect are recorded. This may be due to the geologic environment or spurious electrical effects. The actual negative frequency effect value recorded is indicated on the data plot, however the symbol "NEG" is indicated for the corresponding value of Apparent Metal Factor. In contouring negative values the contour lines are indicated to the nearest positive value in the immediate vicinity of the negative value.

The symbol "NR" indicates that for some reason the operator did not attempt to record a reading although normal survey procedures would suggest that one was required. This may be due to inaccessible topography or other similar reasons. Any symbol other than those discussed above is unique to a particular situation and is described within the body of the report.

# METHOD USED IN PLOTTING DIPOLE-DIPOLE INDUCED POLARIZATION AND RESISTIVITY RESULTS

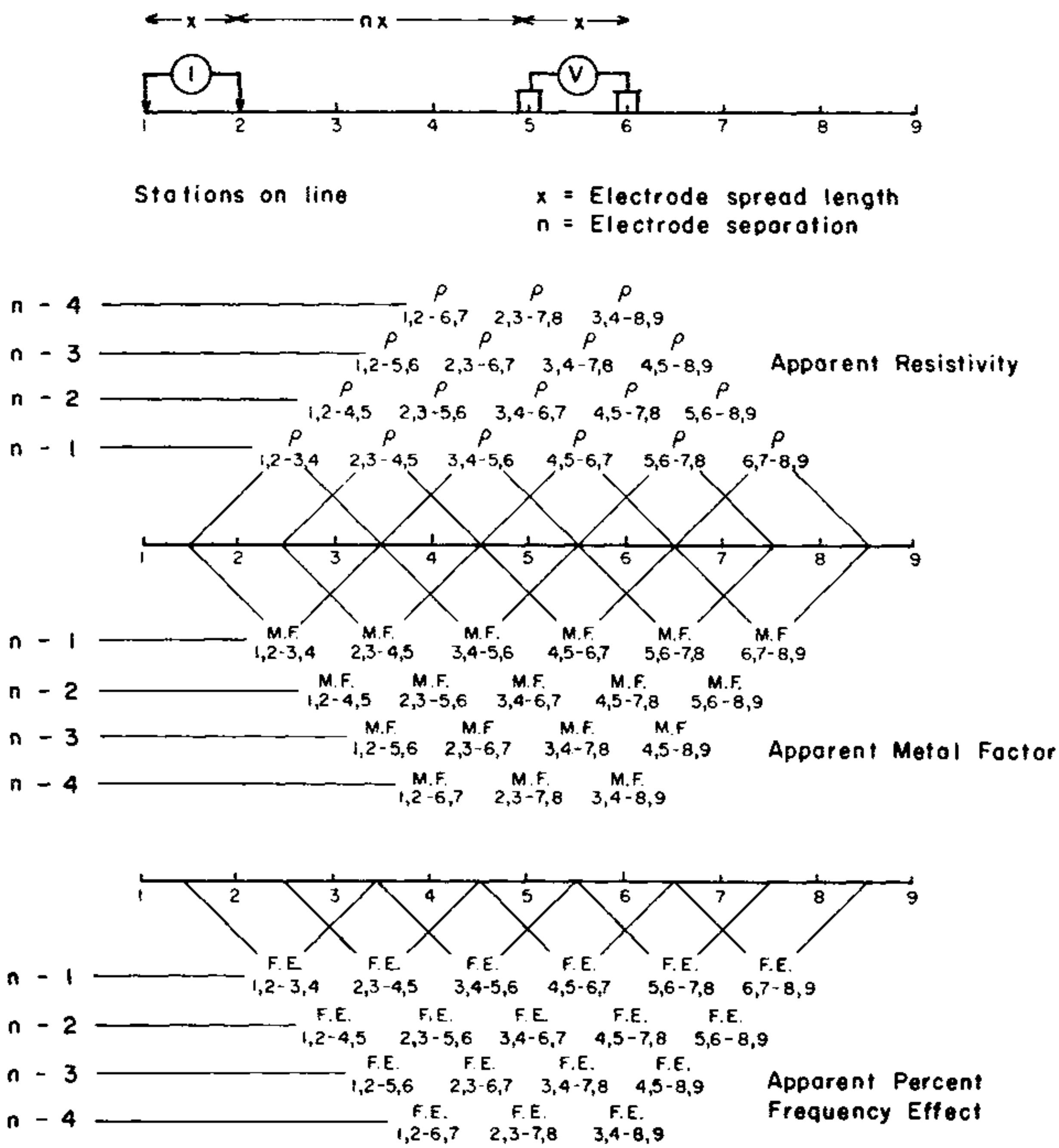


Fig. A

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McPHAR GEOPHYSICS LIMITED

# REPORT ON THE INDUCED POLARIZATION AND RESISTIVITY SURVEY ON THE BEV CLAIM GROUP, CHERRY CREEK AREA, KAMLOOPS MINING DIVISION, B.C. FOR TORWEST RESOURCES (1962) LTD. N.P.L.

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## 1. INTRODUCTION

At the request of the company, we have completed an Induced Polarization and Resistivity survey on the Bev Claim Group in the Cherry Creek area of the Kamloops Mining Division, British Columbia. The location post of the adjoining southern boundaries of claim Win 7 and claim Win 8 lies 1820' due east of 50°39'30" north latitude and 120°34' west longitude. The Trans Canada Highway runs through the claim group from southeast to northwest.

The rock formations underlying the claim group belong to the Kamloops Group of Miocene or earlier age. The Kamloops Group consists of rhyolite, andesite and basalt with associated tuffs, breccias and agglomerates. An isolated occurrence of the Coldwater beds, which underlie the Kamloops volcanics, is noted north of the highway (G.S.C. Map 886A, the Nicola sheet). These beds consist of sandstone, shale, conglomerate and coal. Southwest of the Coldwater beds on the south side of the highway an occurrance of coast intrusives, consisting of granite, granodiorite and gabbro, is mapped.

The IP survey was carried out to locate any deposits of metallic mineralisation which might be present. The work was completed in the last half of June and the first half of July, 1972, using a McPhar P660 high power variable frequency IP unit operating at 0.3 and 5.0 cps over the following claims:

| | |
|---|---|
| Bob | 1, 2, 4 |
| Block | A |
| Sage | 1, 2, 3, 4, 7 Fr., 11 |
| Hill | 12 Fr., 13 Fr., 14 Fr. |
| Bev | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 |
| TT | 1, 2, 3, 4, Fractions, 14, 15, 16, 31, 51, 53, 54, 55, 58, 60, 89, 90, 91, 92, 93. |
| Win | 9, 10 |
| GPl | Lot 550 |

These claims are assumed to be owned or held under option by Torwest Resources (1962) Ltd. N.P.L.

## 2. PRESENTATION OF RESULTS

The Induced Polarisation and Resistivity results are shown on the following data plots in the manner described in the notes preceding this report.

| Line | Electrode Intervals | Dwg. No. |
|---|---|---|
| 0 | 300 feet | IP 5976-1 |
| 400E | 300 feet | IP 5976-2 |
| 800E | 300 feet | IP 5976-3 |
| 1200E | 300 feet | IP 5976-4 |
| 1600E | 300 feet | IP 5976-5 |
| 2000E | 300 feet | IP 5976-6 |
| 2400E | 300 feet | IP 5976-7 |
| 2800E | 300 feet | IP 5976-8 |
| 3200E | 300 feet | IP 5976-9 |
| 3600E | 300 feet | IP 5976-10 |
| 4000E | 300 feet | IP 5976-11 |
| 4400E | 300 feet | IP 5976-12 |
| 4800E | 300 feet | IP 5976-13 |
| 5200E | 300 feet | IP 5976-14 |
| 5600E | 300 feet | IP 5976-15 |
| 6000E | 300 feet | IP 5976-16 |
| 6400E | 300 feet | IP 5976-17 |
| 6800E | 300 feet | IP 5976-18 |
| 7200E | 300 feet | IP 5976-19 |
| 7600E | 300 feet | IP 5976-20 |
| 8000E | 300 feet | IP 5976-21 |
| 8400E | 300 feet | IP 5976-22 |
| 8800E | 300 feet | IP 5976-23 |
| 9200E | 300 feet | IP 5976-24 |

| Line | Electrode Intervals | Dwg. No. |
|---|---|---|
| 9600E | 300 feet | IP 5976-25 |
| 1000E | 300 feet | IP 5976-26 |
| 10400E | 300 feet | IP 5976-27 |
| 10800E | 300 feet | IP 5976-28 |
| 11200E | 300 feet | IP 5976-29 |
| 11600E | 300 feet | IP 5976-30 |
| 12000E | 300 feet | IP 5976-31 |
| 12400E | 300 feet | IP 5976-32 |
| 400E | 300 feet | IP 5976-33 |
| 800E | 300 feet | IP 5976-34 |

Also enclosed with this report is Dwg. I.P.P. 4855, a plan map of the Bev Claim Group Grid at a scale of 1" = 400'. The definite, probable and possible Induced Polarization anomalies are indicated by bars, in the manner shown on the legend, on this plan map as well as on the data plots. These bars represent the surface projection of the anomalous zones as interpreted from the location of the transmitter and receiver electrodes when the anomalous values were measured.

Since the Induced Polarization measurement is essentially an averaging process, as are all potential methods, it is frequently difficult to exactly pinpoint the source of an anomaly. Certainly, no anomaly can be located with more accuracy than the electrode interval length; i.e. when using 300' electrode intervals the position of a narrow sulphide body can only be determined to lie between two stations 300' apart. In order to definitely locate, and fully evaluate, a narrow, shallow source it is necessary to use shorter electrode intervals. In order to locate sources at some depth, larger electrode intervals must be used, with a corresponding increase in the uncertainties of location. Therefore, while the centre of the indicated anomaly probably corresponds fairly well with source, the length of the indicated anomaly along the line should not be taken to represent the exact edges of the anomalous material.

## 3. DISCUSSION OF RESULTS

Two major resistivity changes are mapped with the IP results in Dwg. I.P.P. 4855. The change from moderate to very low resistivity suggests the presence of a fault zone. The second resistivity boundary incompletely encloses an area of high resistivities. It may be possible to identify the source of the high resistivities by geological mapping; in any case, the anomalies located within this area are all weak anomalies representing very weakly disseminated mineralization.

Both metal factor anomalies and frequency effect anomalies have been mapped. Almost everywhere the frequency effect anomalies coincide with some part of metal factor anomalies, but varying in extent and magnitude.

The IP survey located anomalies on all lines except Line 11600E. The results divide the survey grid into three sections, each of which can be discussed as a division of the grid.

### Section I

Section I includes the lines from Line 0 to Line 4400E inclusive. In this section there are two parallel zones of definite to probable anomalies. The western zone, Zone A, runs the length of the section, except that it is broken on Line 800E where the anomaly on strike is only possible. The eastern zone, Zone B, extends from Line 0 to Line 2400E.

Two zones of shorter strike length appear at the southeast end of Section I. Zone C extends from Line 4000E to Line 4800E; the anomalies are definite to probable, as are those of Zone D. The latter zone extends from Line 3600E to Line 4400E.

The central anomalies of the zones are flanked by probable and possible anomalies. Two fairly representative lines are discussed below.

Line 0

The line is anomalous throughout. The anomaly is probable from 16S to 7S, definite from 7S to 1S (Zone A) probable from 1S to 2N, definite from 2N to 8N (Zone B) and possible to the eastern end of the line, where the anomaly is incomplete. The top of the source is less than half an electrode interval deep except for Zone 1, where the greatest magnitude is found on n = 3, about one electrode interval in depth.

The frequency effects show only moderate increases over background. The source of the anomalies could be disseminated mineralisation with the definite portions being concentrated mineralisation and/or a change in the source minerals.

Line 1200E

A definite anomaly from 6S to 12S (Zone A) becomes probable from 15S to 18S. A fence at 16S and a sprinkler pipeline at 14S may have enhanced the anomaly to some extent. The top of the source of the definite anomaly is near 150'.

A second definite anomaly extends from 0 to 3N (Zone B). The top of the source is also near 150'.

A probable, shallow anomaly extends from 6N to 9N; the source could be a narrow vein of massive mineralization. The anomaly should be detailed with shorter electrode intervals to better locate and define the source.

The source of the Zone A anomalies is relatively deep from Line 0 to Line 2000E, less than 150' in depth from Line 2400E to Line 3200E, near 150' on Line 3600E and Line 4000E and less than 150' deep on Line 4400E. The pattern of the anomaly on Line 4400E suggests a vertical source.

If a magnetometer survey has been carried out over the grid, the results should be correlated with the IP results. The two major zones could be tested on Line 2000E by drilling from the following locations:

Zone A - a hole collared at 8S, drilled at 45° to the southwest to reach a vertical depth of 300' under 12S. The probable portion of the anomaly would also be tested.

Zone B - a vertical hole collared at 2S drilled to a depth of 200'.

The drilling results should influence any further testing.

Section II

This section extends from Line 4800E to Line 7200E. The anomalies are all weak, suggesting weakly disseminated mineralization.

The source of the anomalies could be checked by a vertical drill hole to a depth of 200' on Line 6000E at 4N.

Section III

In this section of the grid, the mineralization appears to be more erratic and the definite and probable anomalies have little strike length. The weak anomalies which suggest disseminated mineralization are sporadic in occurrence.

Line 9200E

A definite, shallow metal factor anomaly from 11S to 14S reflects very low resistivities and only slightly increased frequency effects. This anomaly correlates with the southern, incomplete half of a definite anomaly on Line 8800E from 13S to 16S; e.g. both show very low resistivities. Lines to the east and west of these two lines do not extend far enough south to confirm or deny the presence of the source.

A second definite, shallow anomaly from 2S to 5S reflects decreased resistivities and increased frequency effects, but this anomaly is isolated. The frequency effects are weakly anomalous to the northern end of the line but the metal factors are weakly anomalous only from 1N to 4N.

If the anomalies in this section of the grid are of interest, it is recommended that the source of the definite anomaly on Line 9200E from 11S to 14S be tested by drilling. If the results are promising, the IP lines to the east and west should be extended to the south. A possible drill location would be a hole collared at 9S, drilled at a 45° angle to the southwest to a depth of 500'.

## 4. CONCLUSIONS AND RECOMMENDATIONS

The IP survey results divide the grid into three sections, of which

Section I in the northwest appears to be the most promising. Two fairly extensive IP zones and two zones of shorter strike length were outlined. Drill hole locations to test the two major zones were recommended.

Section II occupies the centre of the grid. Weakly disseminated mineralisation appears to be fairly extensive. If the anomalies are checked and the results are of interest, the lines on which the anomalies are incomplete should be extended to fully delineate the source. One drill hole was recommended.

The anomalies in Section III appeared to indicate that the mineralisation is erratic in occurrence and concentration. One drill hole was recommended. If drill results indicate further work, the IP lines should be extended.

A zone of high resistivities is outlined in Dwg. I.P.P. 4855. A suggested fault zone is also indicated by a very low resistivity contact.

McPHAR GEOPHYSICS LIMITED

Philip G. Hallof,
Geophysicist.

Marion A. Goudie,
Geologist.

Dated: August 29, 1972

## ASSESSMENT DETAILS

PROPERTY: Bev Claim Group

MINING DIVISION: Kamloops

SPONSOR: Torwest Resources (1962) Ltd. N.P.L.

PROVINCE: British Columbia

LOCATION: Cherry Creek Area

TYPE OF SURVEY: Induced Polarization

| | | | |
|---|---|---|---|
| OPERATING MAN DAYS: | 65 | DATE STARTED: | June 19, 1972 |
| EQUIVALENT 8 HR. MAN DAYS: | 97.5 | DATE FINISHED: | July 11, 1972 |
| CONSULTING MAN DAYS: | 4.5 | NUMBER OF STATIONS: | 437 |
| DRAUGHTING MAN DAYS: | 8 | NUMBER OF READINGS: | 2268 |
| TOTAL MAN DAYS: | 110 | MILES OF LINE SURVEYED: | 22.9 |

CONSULTANTS:

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FIELD TECHNICIANS:

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Plus Extra Labour:
J. Addlington, 1025 Turner Street, Victoria, B.C.
W. Campbell, c/o McPhar Geophysics Limited, 669 Valdes Drive, Kamloops, B.C.

DRAUGHTSMEN:

R. Peer, 38 Torrens Avenue, Toronto 6, Ontario.
B. Marr, 58 Glencrest Blvd. Toronto 16, Ontario.
F. Hurst, 230 Woburn Avenue, Toronto 12, Ontario.

McPHAR GEOPHYSICS LIMITED

Philip G. Hallof,
Geophysicist.

Dated: August 29, 1972

## STATEMENT OF COST

**Torwest Resources (1962) Ltd. N.P.L. - IP Survey**
**Bev Claim Group, Cherry Creek Area, Kamloops Mining Division, B.C.**

**Crew:** G. Trefenanko & G. Silver

**Total Survey Cost:**

| | | | |
|---|---|---|---|
| 16-1/4 days | Operating | @ $420.00 per day | $6,825.00 |

**Breakdown of Cost**

| | | | |
|---|---|---|---|
| 16-1/4 days | Operating | @ $215.50 per day | $3,501.88 |
| 2 days | Bad Weather | @ $100.00 per day | 200.00 |
| 2-3/4 days | Off | | |
| | | | $3,701.88 |

**Expenses** - prorated

| | | |
|---|---|---|
| Meals and Accommodation | $548.55 | |
| Vehicle Expense | 277.38 | |
| Field Expense | 18.66 | |
| | 844.59 | |
| Plus 10% | 84.46 | |
| | 929.05 | $ 929.05 |

| | | |
|---|---|---|
| Extra Labour | $1,826.42 | |
| Plus 20% | 365.28 | |
| | 2,191.70 | $2,191.70 |
| | | $6,822.63 |

[illegible] GEOPHYSICS LIMITED

Philip G. Hallof,
Geophysicist

Dated: August 29, 1972

## CERTIFICATE

I, Philip George Hallof, of the City of Toronto, Province of Ontario, do hereby certify that:

1. I am a geophysicist residing at 15 Barnwood Court, Don Mills, Ontario.

2. I am a graduate of the Massachusetts Institute of Technology with a B.Sc. Degree (1952) in Geology and Geophysics, and a Ph. D. Degree (1957) in Geophysics.

3. I am a member of the Society of Exploration Geophysicists and the European Association of the Exploration Geophysicists.

4. I am a Professional Geophysicist, registered in the Province of Ontario, the Province of British Columbia and the State of Arizona.

5. I have no direct or indirect interest, nor do I expect to receive any interest directly or indirectly, in the property or securities of Torwest Resources (1962) Ltd. N.P.L. or any affiliate.

6. The statements made in this report are based on a study of published geological literature and unpublished private reports.

7. Permission is granted to use in whole or in part for assessment and qualification requirements but not for advertising purposes.

Dated at Toronto

This 29th day of August 1972

PROFESSIONAL PROVINCE OF ...

Philip G. Hallof, Ph. D.

## CERTIFICATE

I, Marion A. Goudie, of the City of Toronto, Province of Ontario, do hereby certify that:

1. I am a geologist residing at 739 Military Trail, West Hill, Ontario.

2. I am a graduate of the University of Western Ontario with a B.Sc. Degree (1950) in Honours Geology.

3. I am a member of the Geological Society of America.

4. I have been practising my profession for 23 years.

5. I have no direct or indirect interest, nor do I expect to receive any interest directly or indirectly, in the property or securities of Torwest Resources (1962) Ltd. N.P.L. or any affiliate.

6. The statements made in this report are based on a study of published geological literature and unpublished private reports.

7. Permission is granted to use in whole or in part for assessment and qualification requirements but not for advertising purposes.

Dated at Toronto

This 29th day of August 1972

Marion A. Goudie

Marion A. Goudie, B.Sc.

## APPENDIX A

## EXPECTED IP ANOMALIES FROM "PORPHYRY COPPER" TYPE ZONES OF DISSEMINATED SULPHIDE MINERALIZATION

Our experience in other areas has shown that the induced polarization method can be successfully used to locate, and outline, zones of disseminated sulphide mineralization of the "porphyry copper" type. In most cases the interpretation of the IP results is simple and straightforward. The results shown in Figure 1 and Figure 2 are typical.

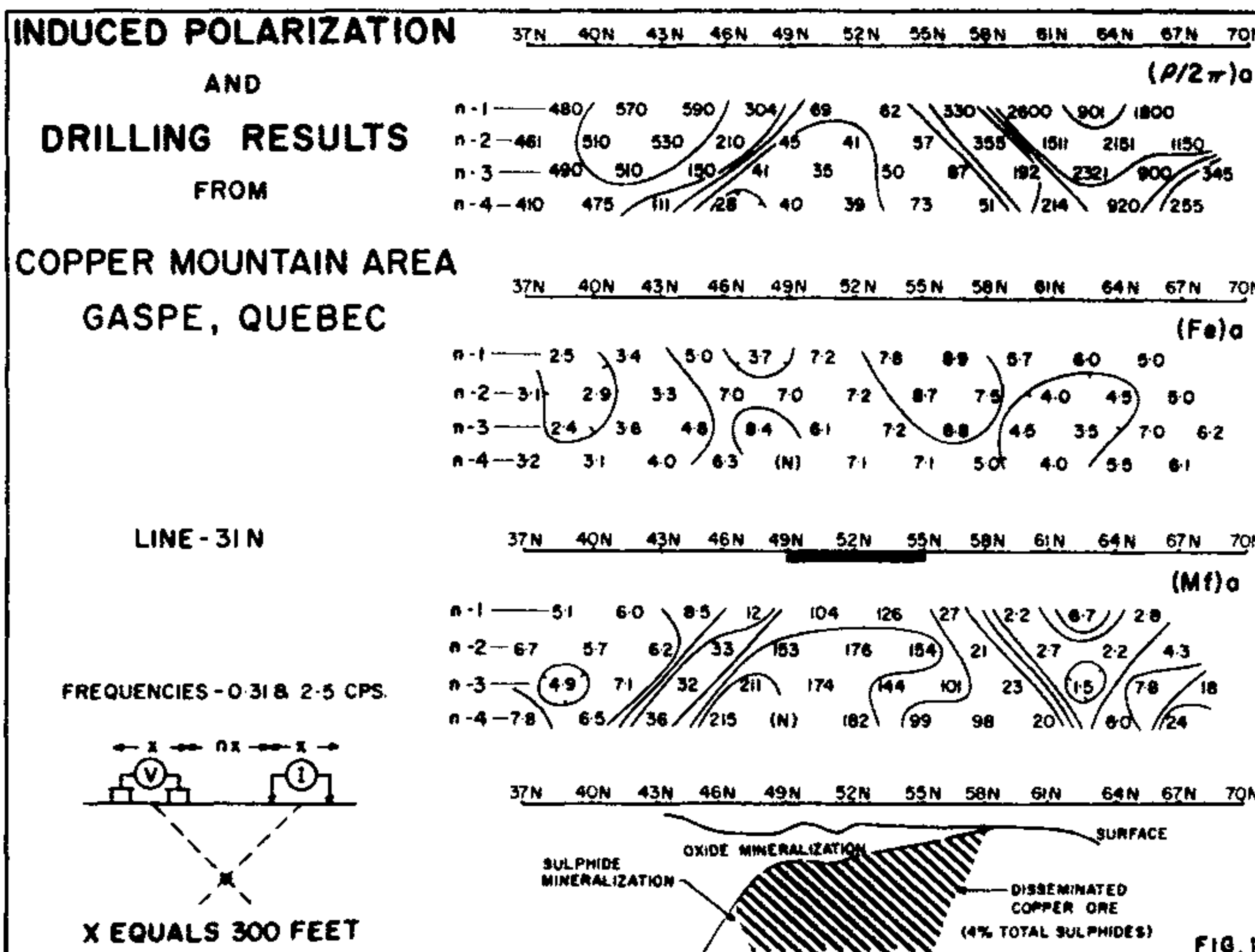



FIG. 1

The source of the moderate magnitude IP anomaly shown in Figure 1 contains approximately 4% metallic mineralization. The zone is of limited lateral extent and enough copper is present to make the mineralization "ore grade". The presence of the surface oxidation can be seen in the fact that the apparent IP effects increase for n = 2.

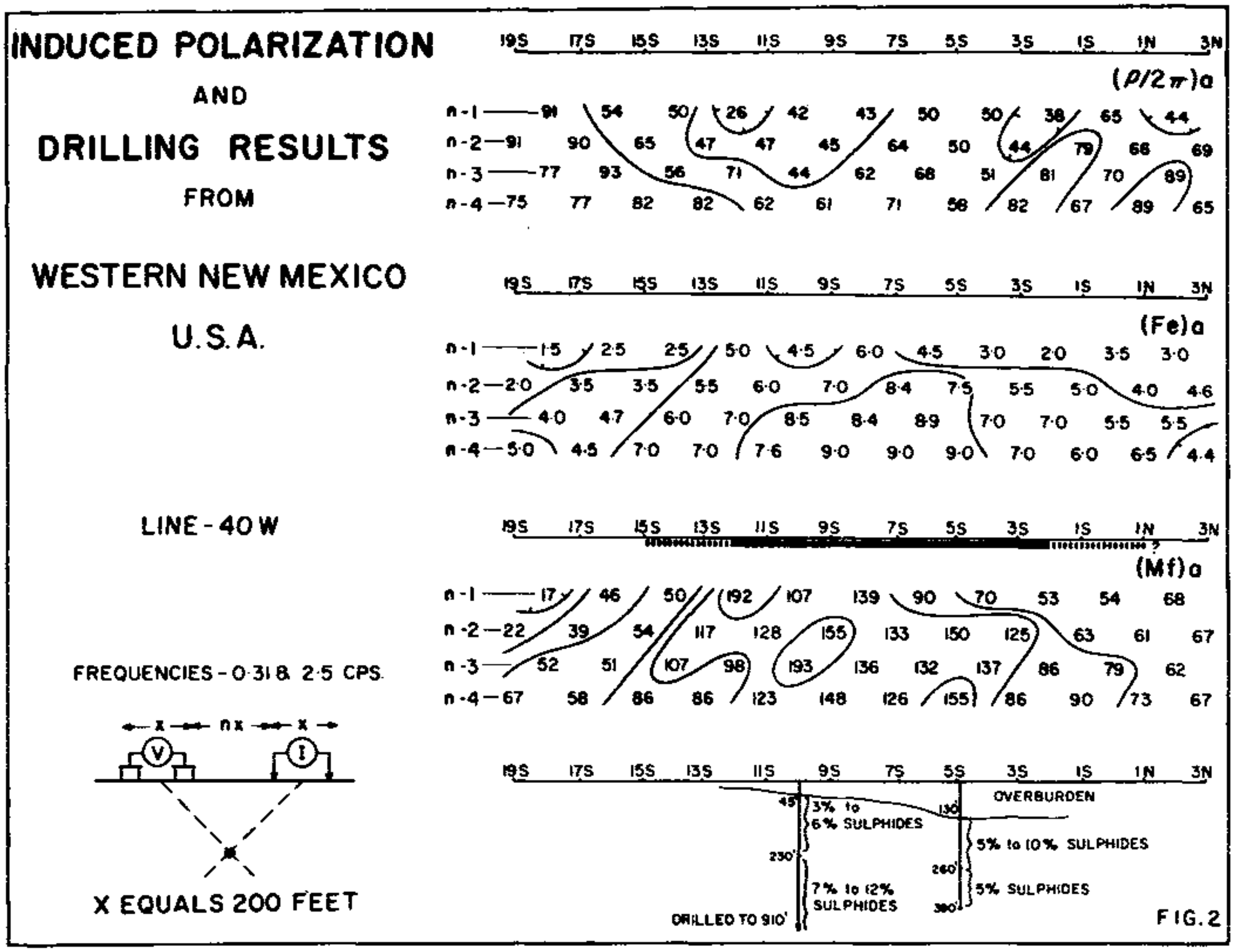


FIG. 2

The IP anomaly shown in Figure 2 has about the same magnitude as that described above. It should be noted that appreciably greater concentrations of metallic mineralization are present; further, there is little or no copper present. These results illustrate the fact that IP results can not be used to determine the exact amount of metallic mineralization present or to determine the economic importance of a mineralized zone. In some geologic situations zoning is present; the zones of mineralization of greatest economic value may contain less total metallic mineralization than other zones in the same general area.

In the proper geologic environment, the method will detect even very low concentrations of metallic mineralization. The IP results shown in Figure 3 located the ore zone at the Brenda Property near Peachland, B. C. The zone contains 1. 0 to 1. 5 per cent metallic mineralization; however, the mineralization is "ore grade" because only molybdenite and chalcopyrite are present.

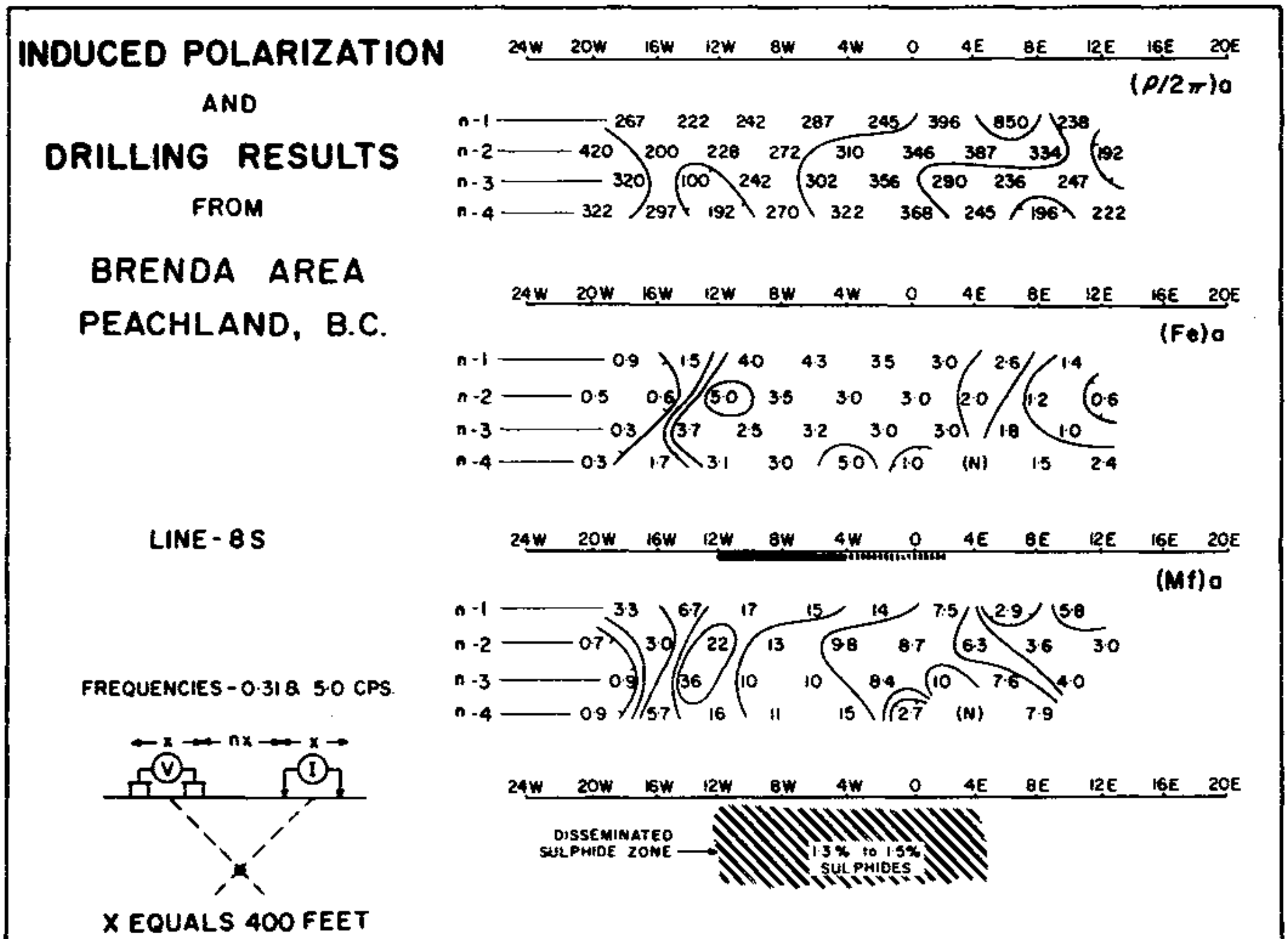



FIG. 3

## APPENDIX B
## THE INTERPRETATION OF INDUCED POLARIZATION ANOMALIES FROM RELATIVELY SMALL SOURCES

The induced polarization method was originally developed to detect disseminated sulphides and has proven to be very successful in the search for "porphyry copper" deposits. In recent years we have found that the IP method can also be very useful in exploring for more concentrated deposits of limited size. This type of source gives sharp IP anomalies that are often difficult to interpret.

The anomalous patterns that develop on the contoured data plots will depend on the size, depth and position of the source and the relative size of the electrode interval. The data plots are not sections showing the electrical parameters of the ground. When the electrode interval (X) is appreciably greater than the width of the source, a large volume of unmineralized rock is averaged into each measurement. This is particularly true for the large values of the electrode separation (n).

The theoretical scale model results shown in Figure 1 and Figure 2 indicate the effect of depth. If the depth to the top of the source is small compared to the electrode interval (i. e. d X) the measurement for n = 1 will be anomalous. In Figure 1 the depth is 0. 5 units (X = 1. 0 units) and the n = 1 value is definitely anomalous; the pattern on the contoured data plot is typical for a relatively shallow, narrow, near-vertical tabular source. The results in Figure 2 are for the same source with the depth increased to 1. 5 units. Here the n = 1 value is not anomalous; the larger values of (n) are anomalous but the magnitudes are much lower than for the source at less depth.

When the electrode interval is greater than the width of the source, it is not possible to determine its width or exact position between the electrodes. The true IP effect within the source is also indeterminate; the anomaly from a very narrow source with a very large true IP effect will be much the same as that from a zone with twice the width and 1/2 the true IP effect. The theoretical scale model data shown in Figure 3 and Figure 4 demonstrate this problem. The depth and position of the source are unchanged but the width and true IP effect are varied. The anomalous patterns and magnitudes are essentially the same, hence the data are insufficient to evaluate the source completely.

The normal practise is to indicate the IP anomalies by solid, broken, or dashed bars, depending upon their degree of distinctiveness. These bars represent the surface projection of the anomalous zones as interpreted from the location of the transmitter and receiver electrodes when the anomalous values were measured. As illustrated in Figure 1, Figure 2, Figure 3 and Figure 4, no anomaly can be located with more accuracy than the spread length. While the centre of the solid bar indicating the anomaly corresponds fairly well with the source, the length of the bar should not be taken to represent the exact edges of the anomalous material.

If the source is shallow, the anomaly can be better evaluated using a shorter electrode interval. When the electrode interval used approaches the width of the source, the apparent effects measured will be nearly equal to the true effects within the source. When there is some depth to the top of the source, it is not possible to use electrode intervals that are much less than the depth to the source. In this situation, one must realize that a definite ambiguity exists regarding the width of the source and the IP effect within the source.

Our experience has confirmed the desirability of doing detail. When a reconnaissance IP survey using a relatively large electrode interval indicates the presence of a narrow, shallow source, detail with shorter electrode intervals is necessary in order to better locate, and evaluate, the source. The data of most usefulness is obtained when the maximum apparent IP effect is measured for n = 2 or n = 3. For instance, an anomaly originally located using X = 300' may be checked with X = 200' and then X = 100'. The data with X = 100' will be quite different from the original reconnaissance results with X = 300'.

The data shown in Figure 5 and Figure 6 are field results from a greenstone area in Quebec. The expected sources were narrow (less than 30' in width) zones of massive, high-grade, zinc-silver ore. An electrode interval of 200' was used for the reconnaissance survey in order to keep the rate of progress at an acceptable level. The anomalies located were low in magnitude.

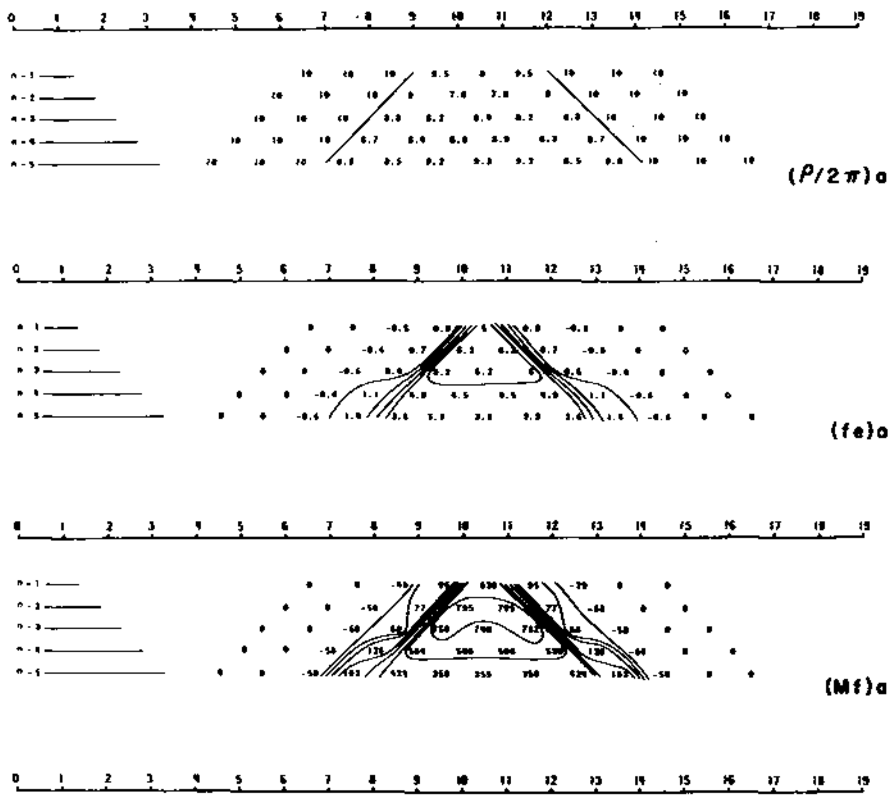
The very weak, shallow anomaly shown in Figure 5 is typical of those located by the X = 200' reconnaissance survey. Several anomalies of this type were detailed using shorter electrode intervals. In most cases the detail measurements suggested broad zones of very weak mineralization. However, in the case of the source at 20N to 22N, the measurements with shorter electrode intervals confirmed the presence of a strong, narrow source. The X = 50' results are shown in Figure 6. Subsequent drilling has shown the source to be 12.5' of massive sulphide mineralization containing significant zinc and silver values.

The change in the anomaly that results when the electrode interval is reduced is not unusual. The X = 50' data more accurately locates the narrow source, and permits the geophysicist to make a better evaluation of its importance. The completion of this type of detail is very important, in order to get the maximum usefulness from a reconnaissance IP survey.

# McPHAR GEOPHYSICS LIMITED

## Theoretical Induced Polarization and Resistivity Studies

### Scale Model Cases



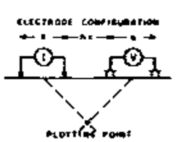

$(\rho/2\pi)_1 = 10$

$(Mf)_1 = 0$

$(\rho/2\pi)_2 = 2.51$

$(Mf)_2 = 10000$

$(fe)_2 = 25\%$



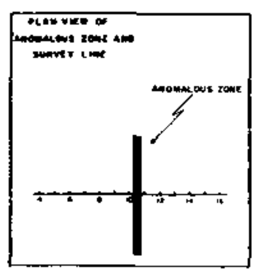



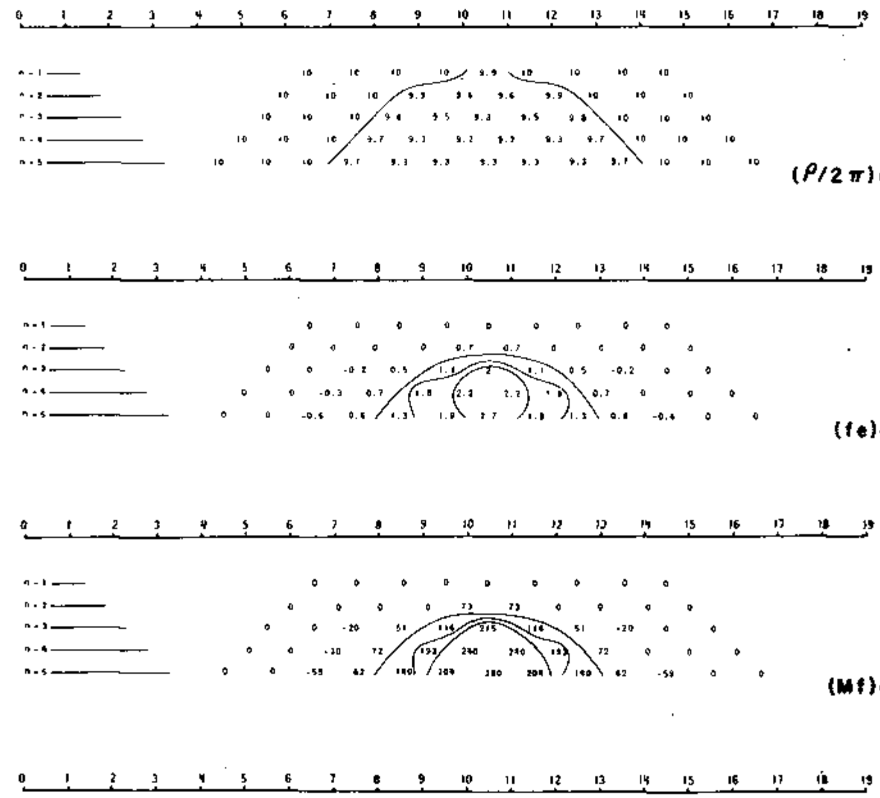

FIG 1

CASE II-0.5-BU-10-a

# McPHAR GEOPHYSICS LIMITED

## Theoretical Induced Polarization and Resistivity Studies

### Scale Model Cases



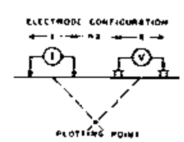

$(\rho/2\pi)_1 = 10$

$(Mf)_1 = 0$

$(\rho/2\pi)_2 = 2.6$

$(Mf)_2 = 9250$

$(fe)_2 = 24\%$



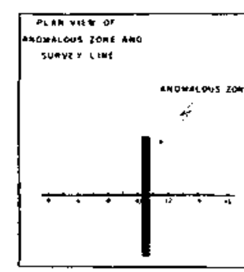
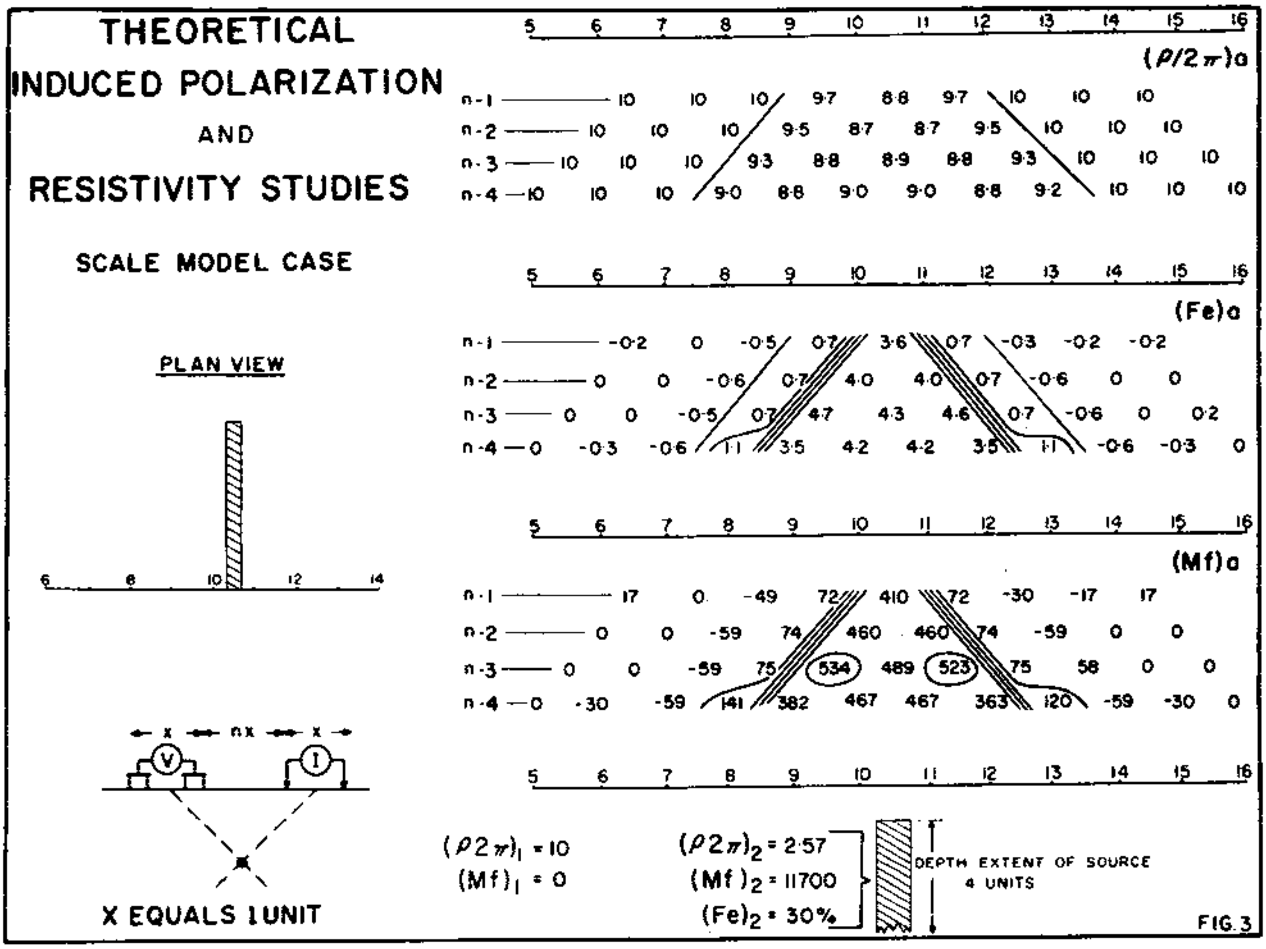
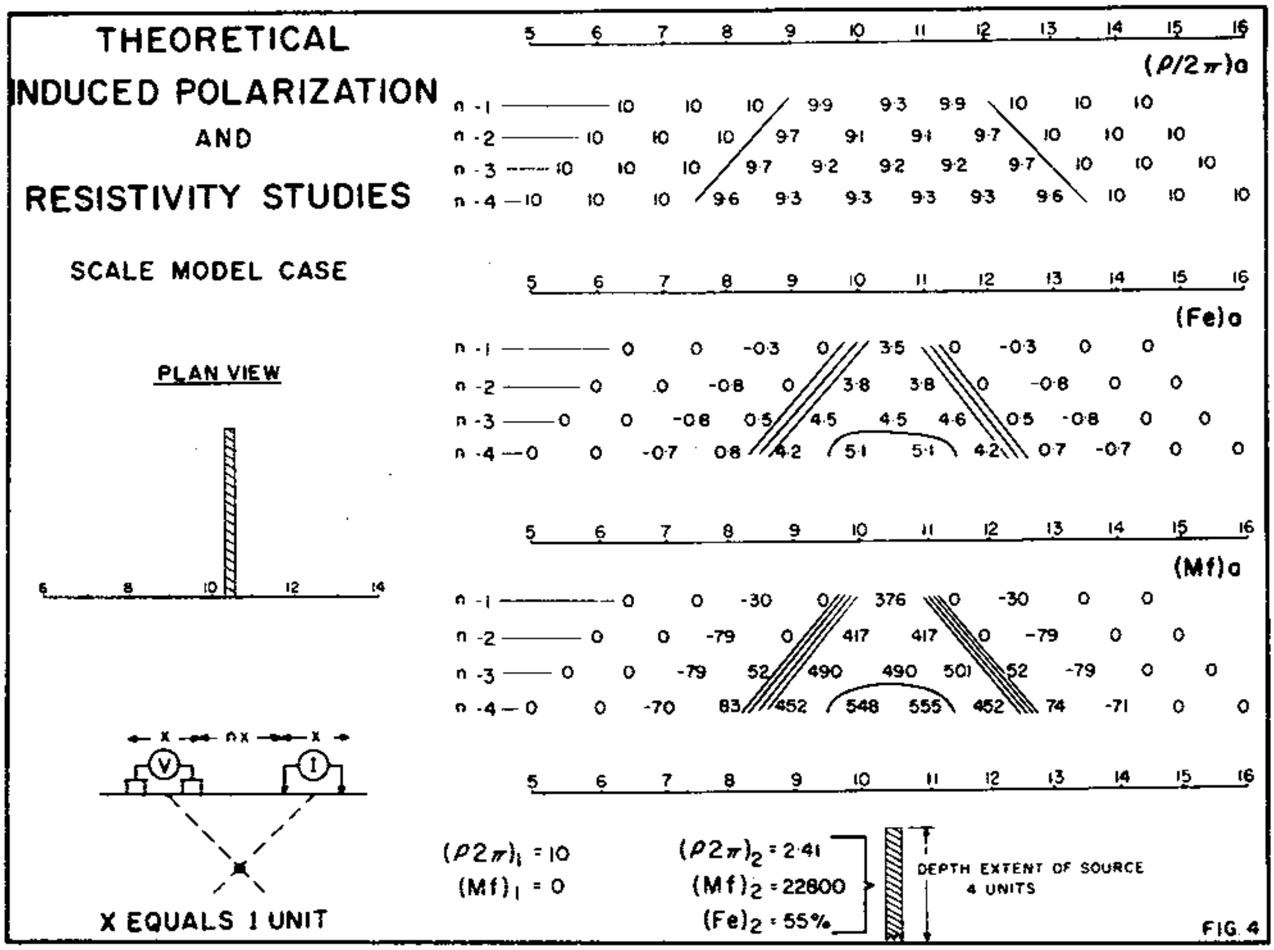




FIG 2

CASE II-1.5-BU-10-a


THEORETICAL
INDUCED POLARIZATION
AND
RESISTIVITY STUDIES
SCALE MODEL CASE
PLAN VIEW
6 8 10 12 14
X nX X
V I
X EQUALS 1 UNIT
5 6 7 8 9 10 11 12 13 14 15 16
(ρ/2π)a
n-1 10 10 10 9.7 8.8 9.7 10 10 10
n-2 10 10 10 9.5 8.7 8.7 9.5 10 10 10
n-3 10 10 10 9.3 8.8 8.9 8.8 9.3 10 10 10
n-4 10 10 10 9.0 8.8 9.0 9.0 8.8 9.2 10 10 10
5 6 7 8 9 10 11 12 13 14 15 16
(Fe)a
n-1 -0.2 0 -0.5 0.7 3.6 0.7 -0.3 -0.2 -0.2
n-2 0 0 -0.6 0.7 4.0 4.0 0.7 -0.6 0 0
n-3 0 0 -0.5 0.7 4.7 4.3 4.6 0.7 -0.6 0 0.2
n-4 0 -0.3 -0.6 1.1 3.5 4.2 4.2 3.5 1.1 -0.6 -0.3 0
5 6 7 8 9 10 11 12 13 14 15 16
(Mf)a
n-1 17 0 -49 72 410 72 -30 -17 17
n-2 0 0 -59 74 460 460 74 -59 0 0
n-3 0 0 -59 75 534 489 523 75 58 0 0
n-4 0 -30 -59 141 382 467 467 363 120 -59 -30 0
5 6 7 8 9 10 11 12 13 14 15 16
(ρ2π)1 = 10
(Mf)1 = 0
(ρ2π)2 = 2.57
(Mf)2 = 11700
(Fe)2 = 30%
DEPTH EXTENT OF SOURCE
4 UNITS
FIG. 3


THEORETICAL
INDUCED POLARIZATION
AND
RESISTIVITY STUDIES
SCALE MODEL CASE
PLAN VIEW
6 8 10 12 14
X nX X
V I
X EQUALS 1 UNIT
5 6 7 8 9 10 11 12 13 14 15 16
(ρ/2π)a
n-1 10 10 10 9.9 9.3 9.9 10 10 10
n-2 10 10 10 9.7 9.1 9.1 9.7 10 10 10
n-3 10 10 10 9.7 9.2 9.2 9.2 9.7 10 10 10
n-4 10 10 10 9.6 9.3 9.3 9.3 9.3 9.6 10 10 10
5 6 7 8 9 10 11 12 13 14 15 16
(Fe)a
n-1 0 0 -0.3 0 3.5 0 -0.3 0 0
n-2 0 0 -0.8 0 3.8 3.8 0 -0.8 0 0
n-3 0 0 -0.8 0.5 4.5 4.5 4.6 0.5 -0.8 0 0
n-4 0 0 -0.7 0.8 4.2 5.1 5.1 4.2 0.7 -0.7 0 0
5 6 7 8 9 10 11 12 13 14 15 16
(Mf)a
n-1 0 0 -30 0 376 0 -30 0 0
n-2 0 0 -79 0 417 417 0 -79 0 0
n-3 0 0 -79 52 490 490 501 52 -79 0 0
n-4 0 0 -70 83 452 548 555 452 74 -71 0 0
5 6 7 8 9 10 11 12 13 14 15 16
(ρ2π)1 = 10
(Mf)1 = 0
(ρ2π)2 = 2.41
(Mf)2 = 22800
(Fe)2 = 55%
DEPTH EXTENT OF SOURCE
4 UNITS
FIG. 4

INDUCED POLARIZATION AND RESISTIVITY RESULTS

BATCHELOR LAKE AREA, QUEBEC.

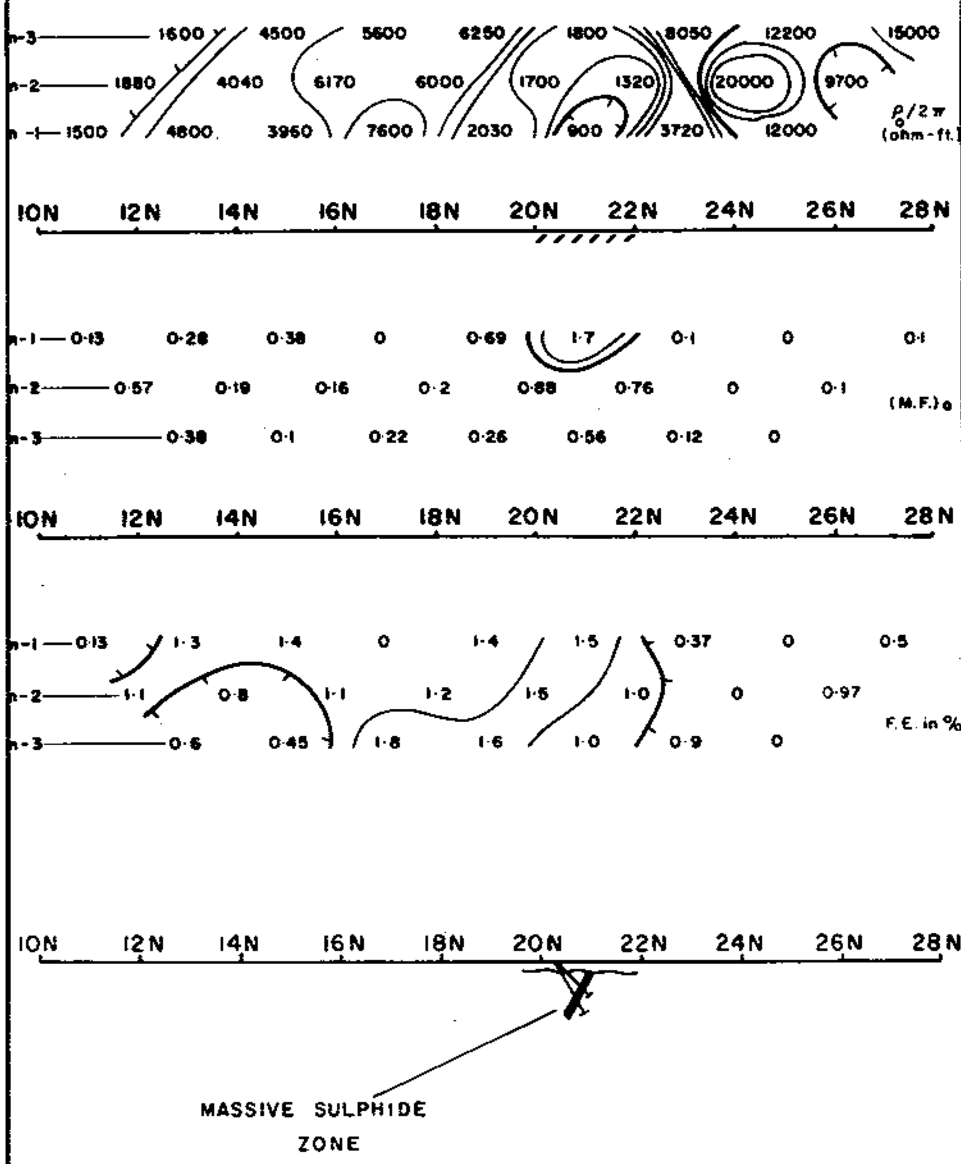



FIG. 5

INDUCED POLARIZATION AND RESISTIVITY RESULTS

BATCHELOR LAKE AREA, QUEBEC.

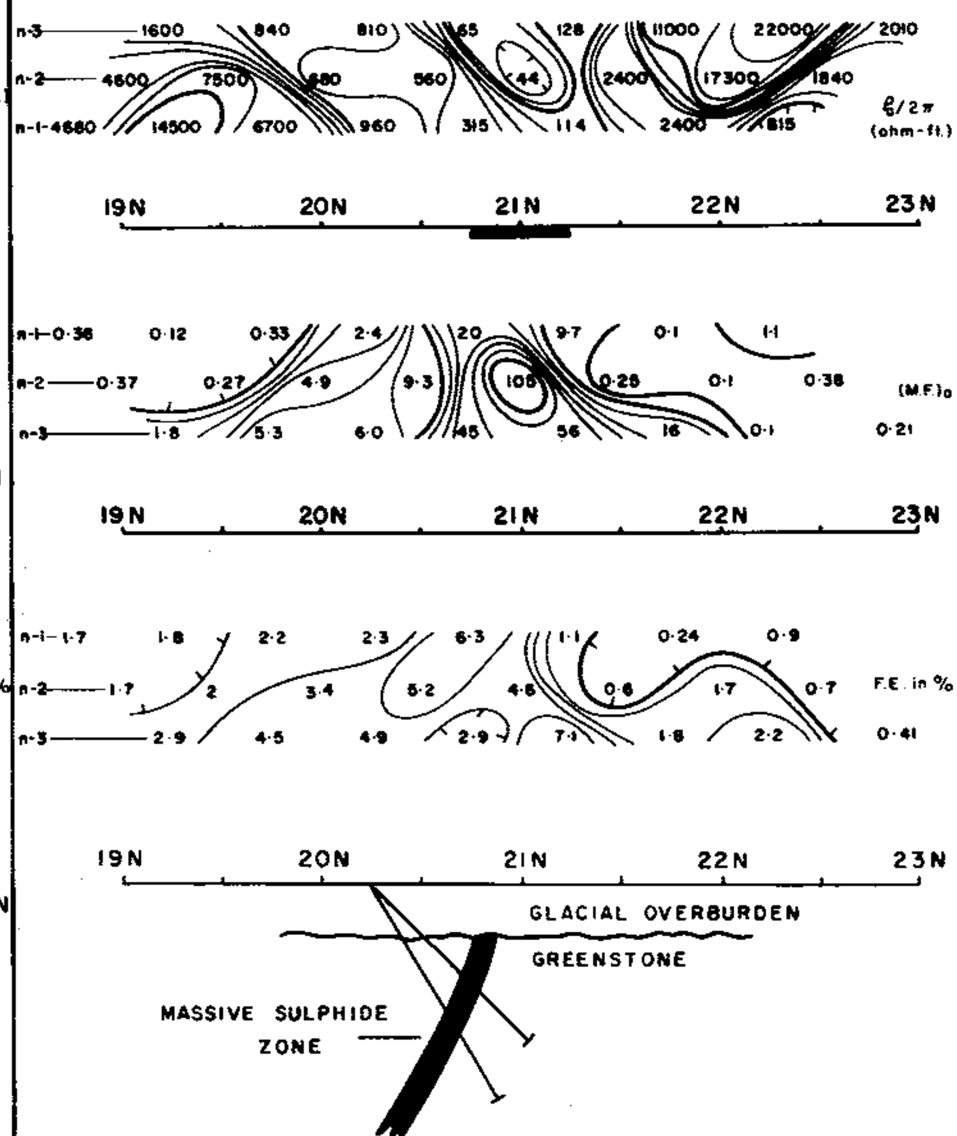
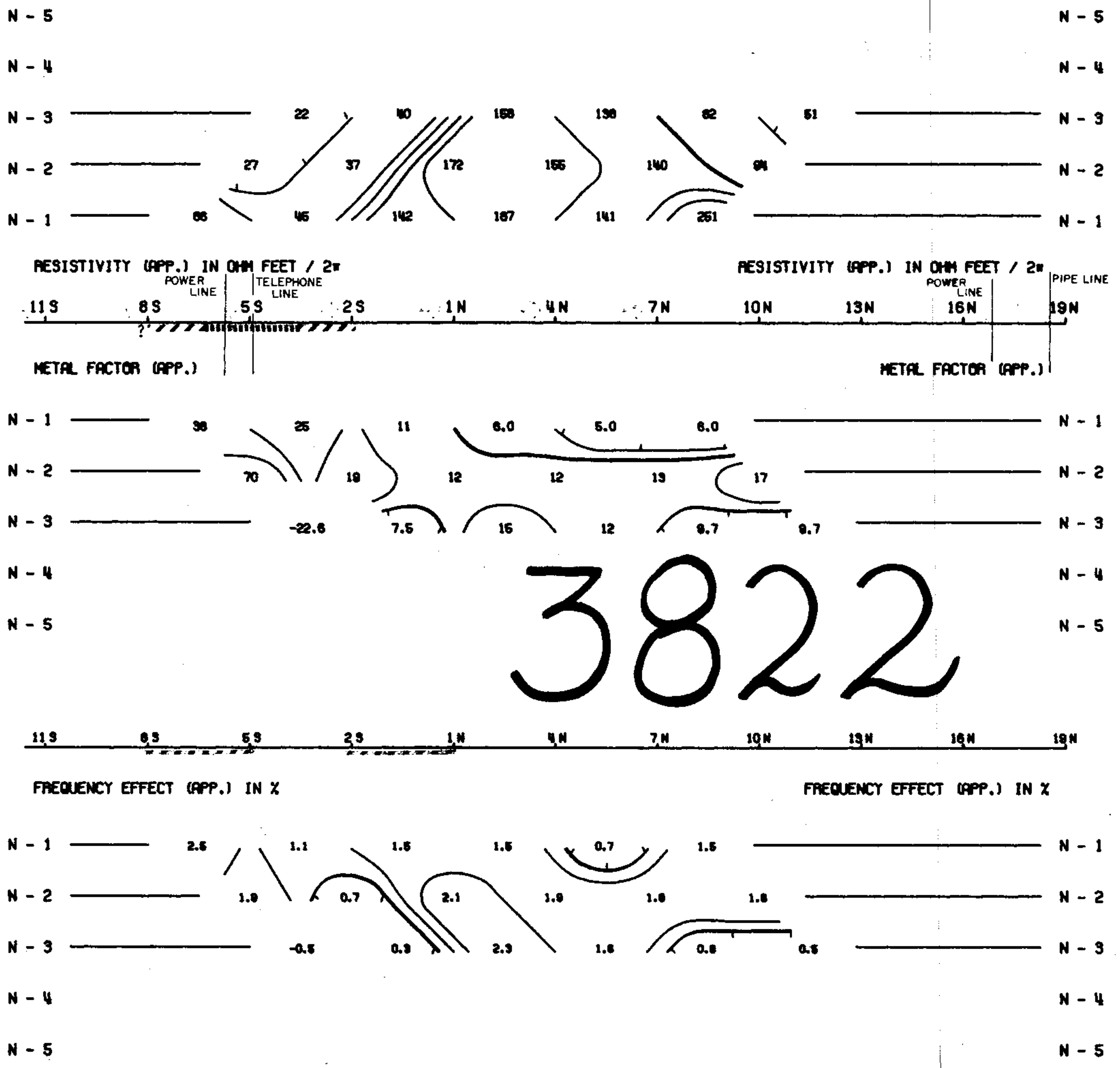



FIG. 6




DWG. NO.- I.P.-5976-34

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 800E

ELECTRODE CONFIGURATION

X NX X

PLOTTING POINT X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: 1972

APPROVED:

DATE: 27/2/72

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

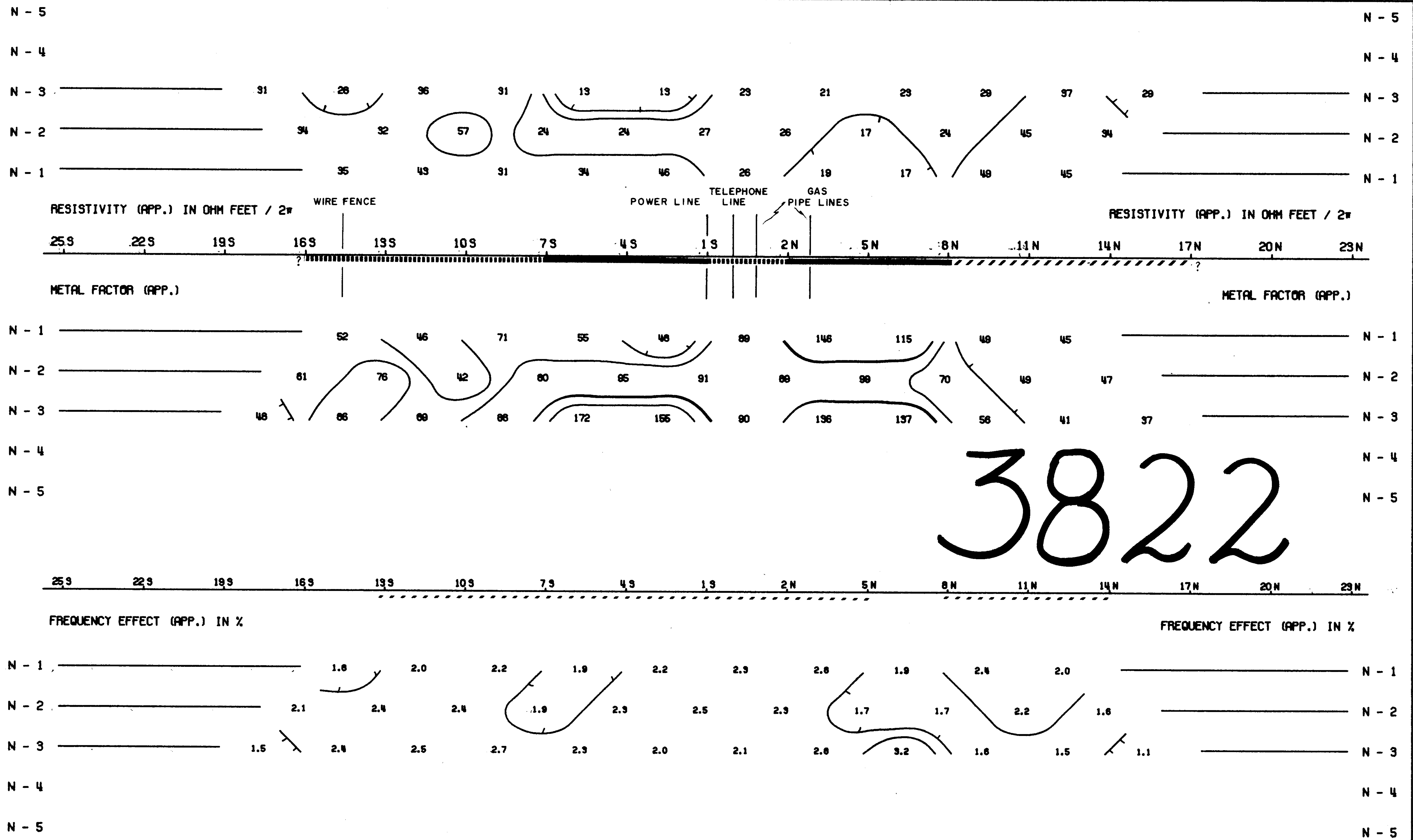
PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA PHILIP G. HALLOF

Expiry Date: February 25, 1973

## McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



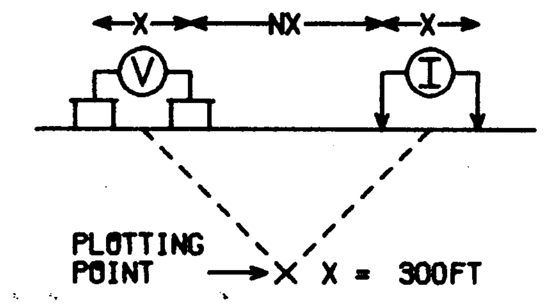

DWG. NO.- I.P.-5976-1

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 0

ELECTRODE CONFIGURATION




SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUN 1972

APPROVED:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

DATE:

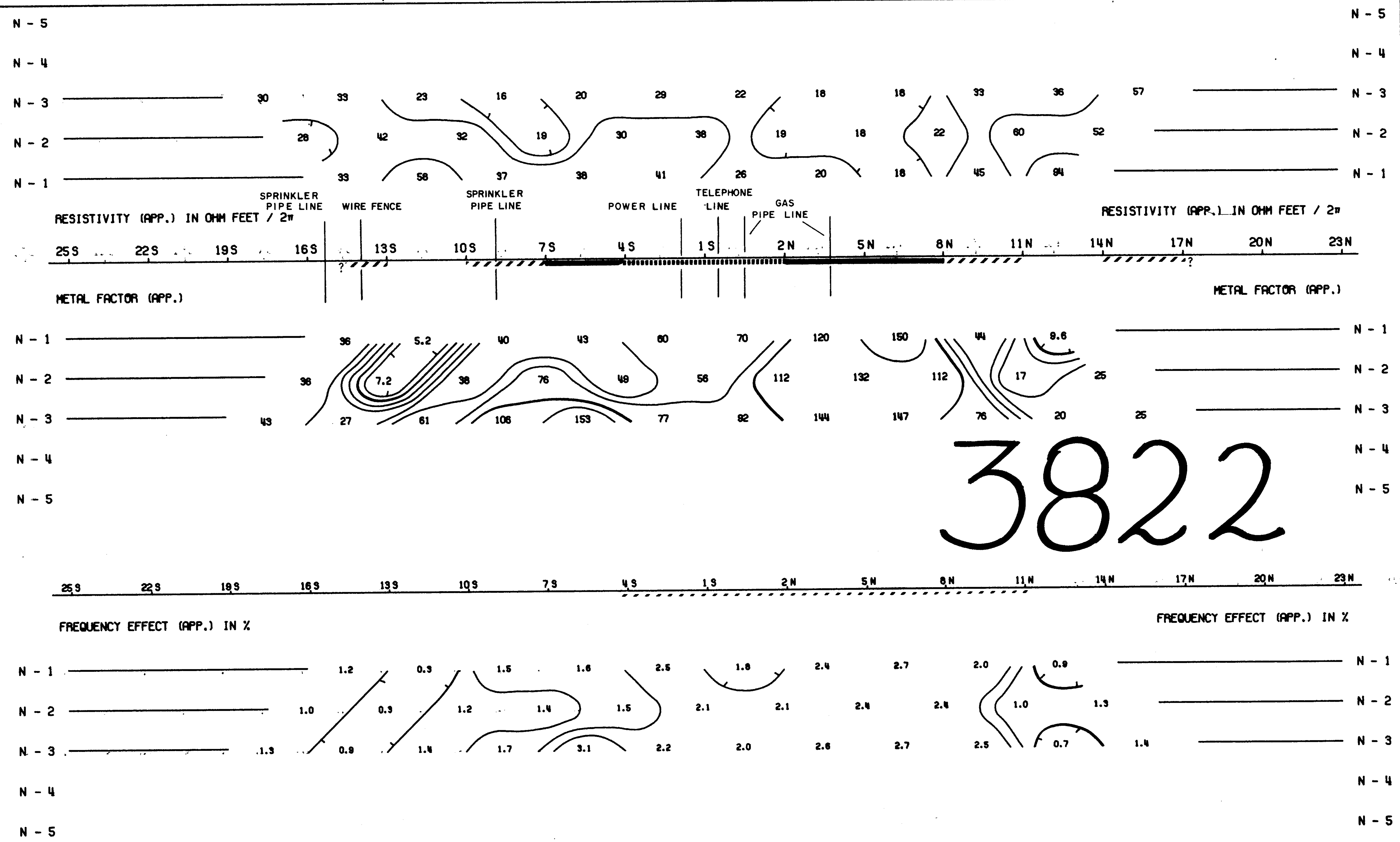
PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — PHILIP G. HALLOF

Expiry Date: February 25, 1973

## McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



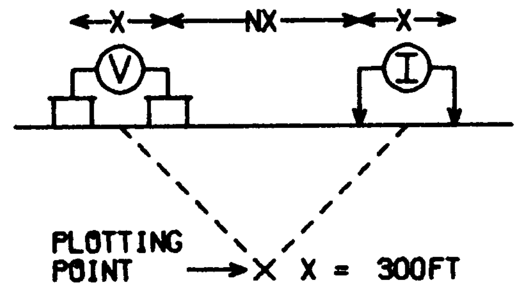

DWG. NO.- I.P.-5976-2

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 400E

ELECTRODE CONFIGURATION




PLOTTING POINT → X  X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES
DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUN 1972

APPROVED:

DATE:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA

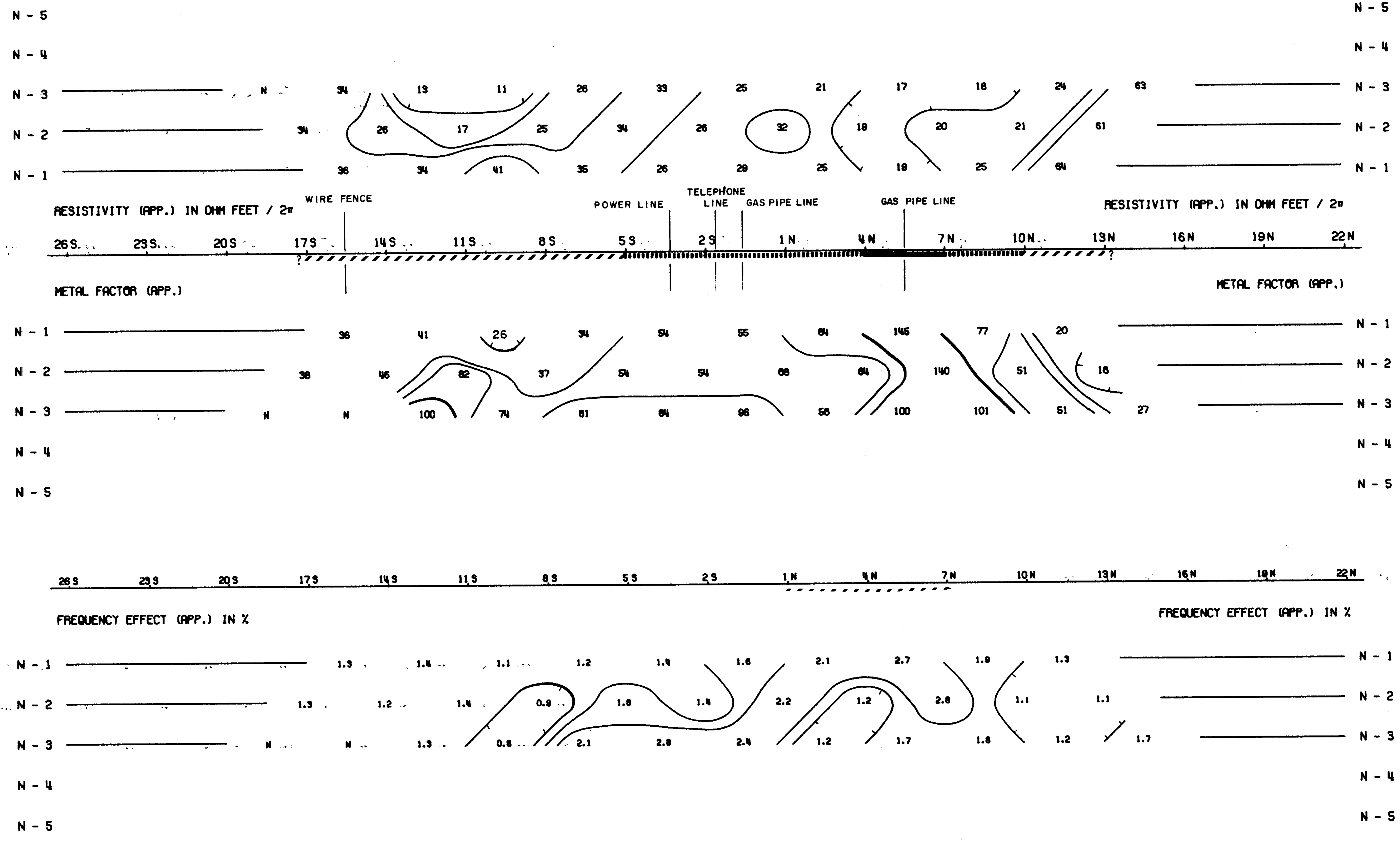
Expiry Date: February 25, 1973

## McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION

DWG. NO.- I.P.-5976-3

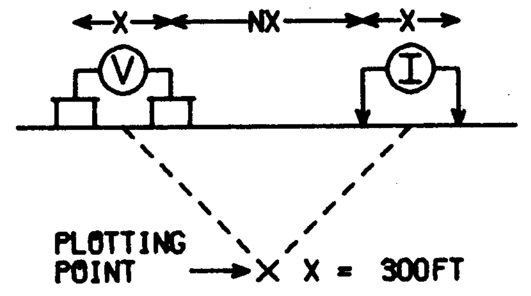



# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 800E

ELECTRODE CONFIGURATION




SURFACE PROJECTION OF ANOMALOUS ZONES
DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUN 1972

APPROVED:

DATE:

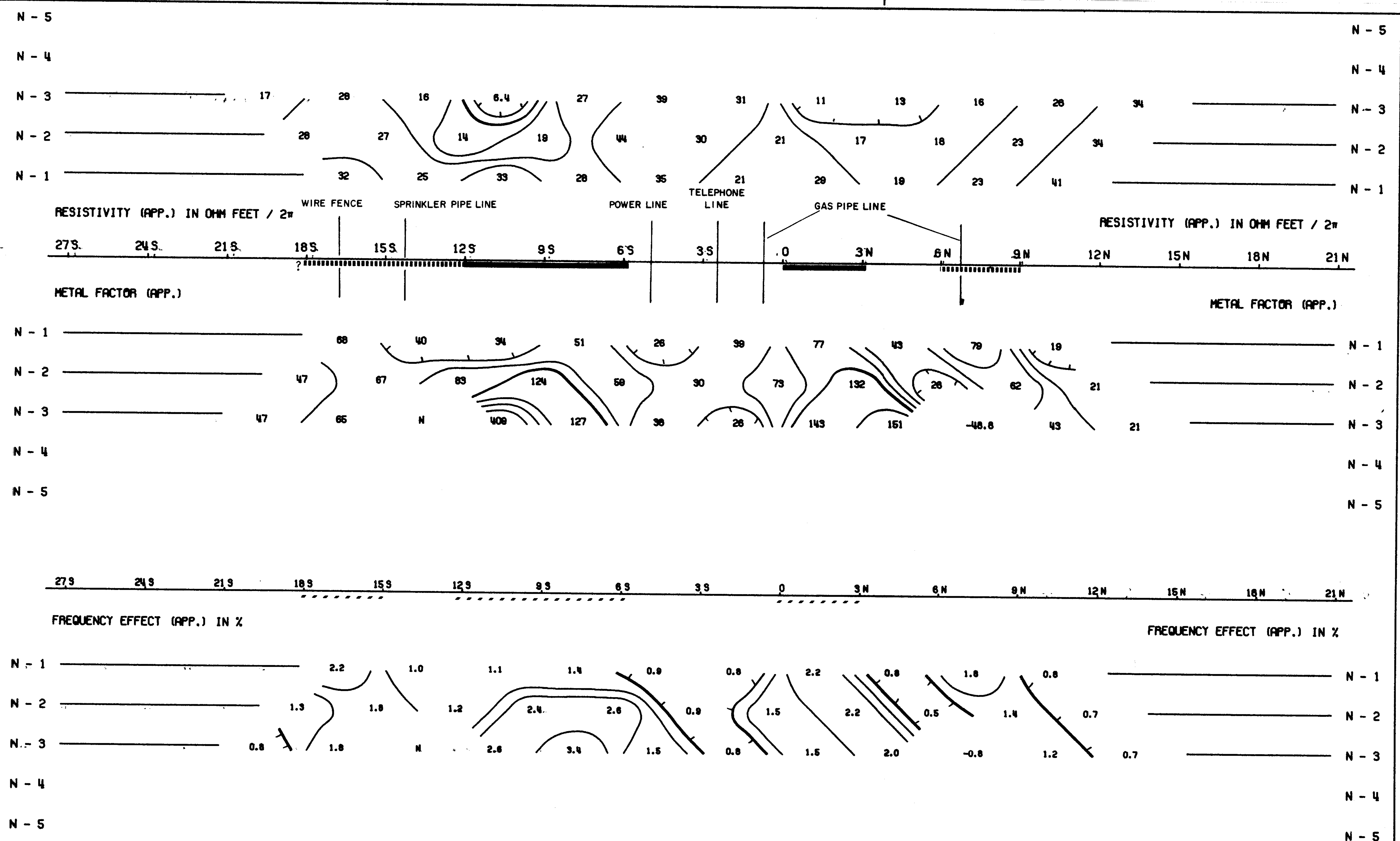
NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

PROFESSIONAL ENGINEER, PROVINCE OF BRITISH COLUMBIA
Expiry Date: February 25, 1973

## McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION




DWG. NO.- I.P.-5976-4

# TØRWEST RESØURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA, KAMLOOPS M.D., B.C.

LINE NO.- 1200E

ELECTRODE CONFIGURATION

PLOTTING POINT X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUN 1972

APPROVED:

DATE:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

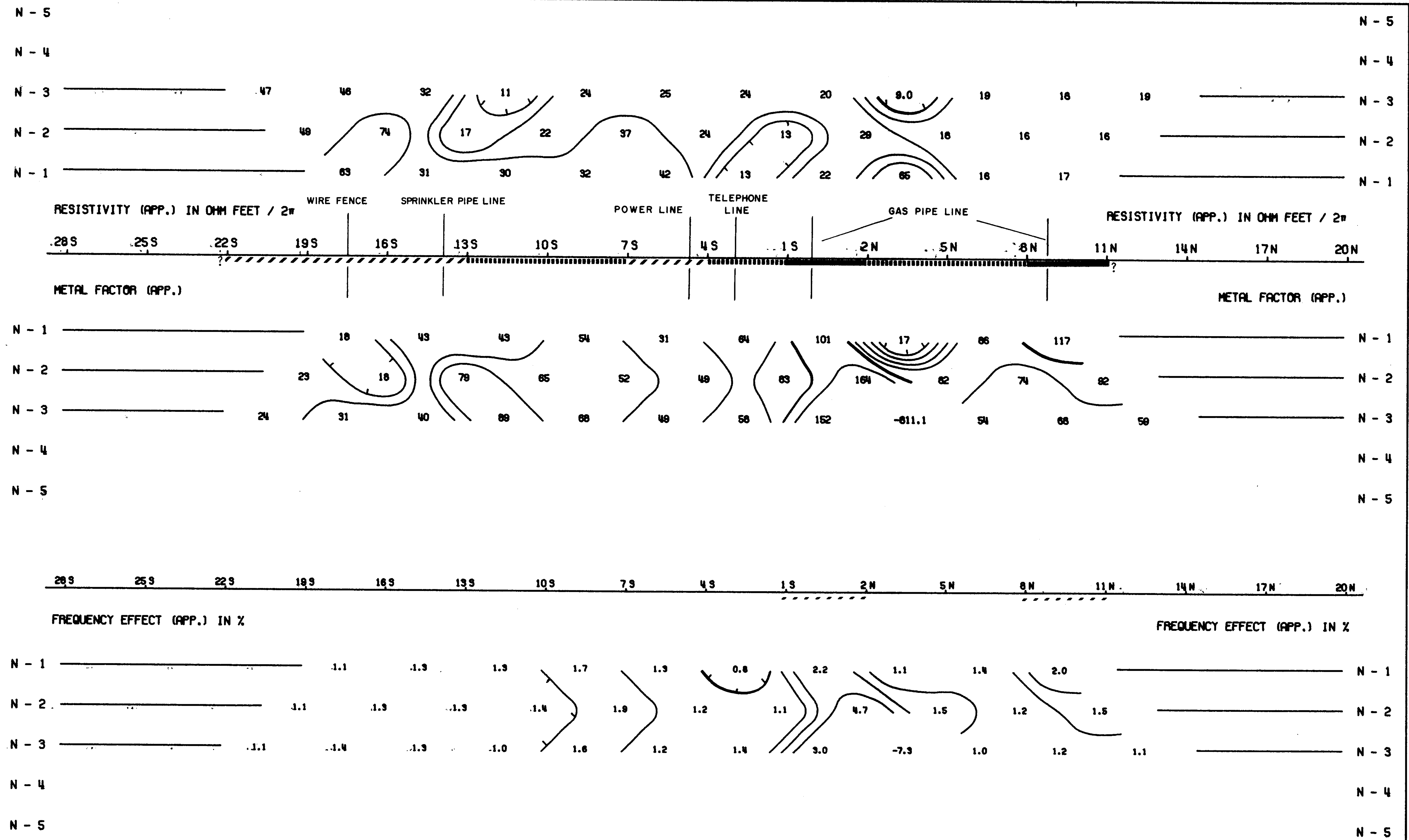
PROFESSIONAL ENGINEER, PROVINCE OF BRITISH COLUMBIA

Expiry Date: February 25, 1973

## McPHAR GEØPHYSICS

INDUCED PØLARIZATIØN AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION




DWG. NO.- I.P.-5976-5

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA, KAMLOOPS M.D., B.C.

LINE NO.- 1600E

ELECTRODE CONFIGURATION

X — NX — X

PLOTTING POINT → X X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUN 1972

APPROVED

DATE

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

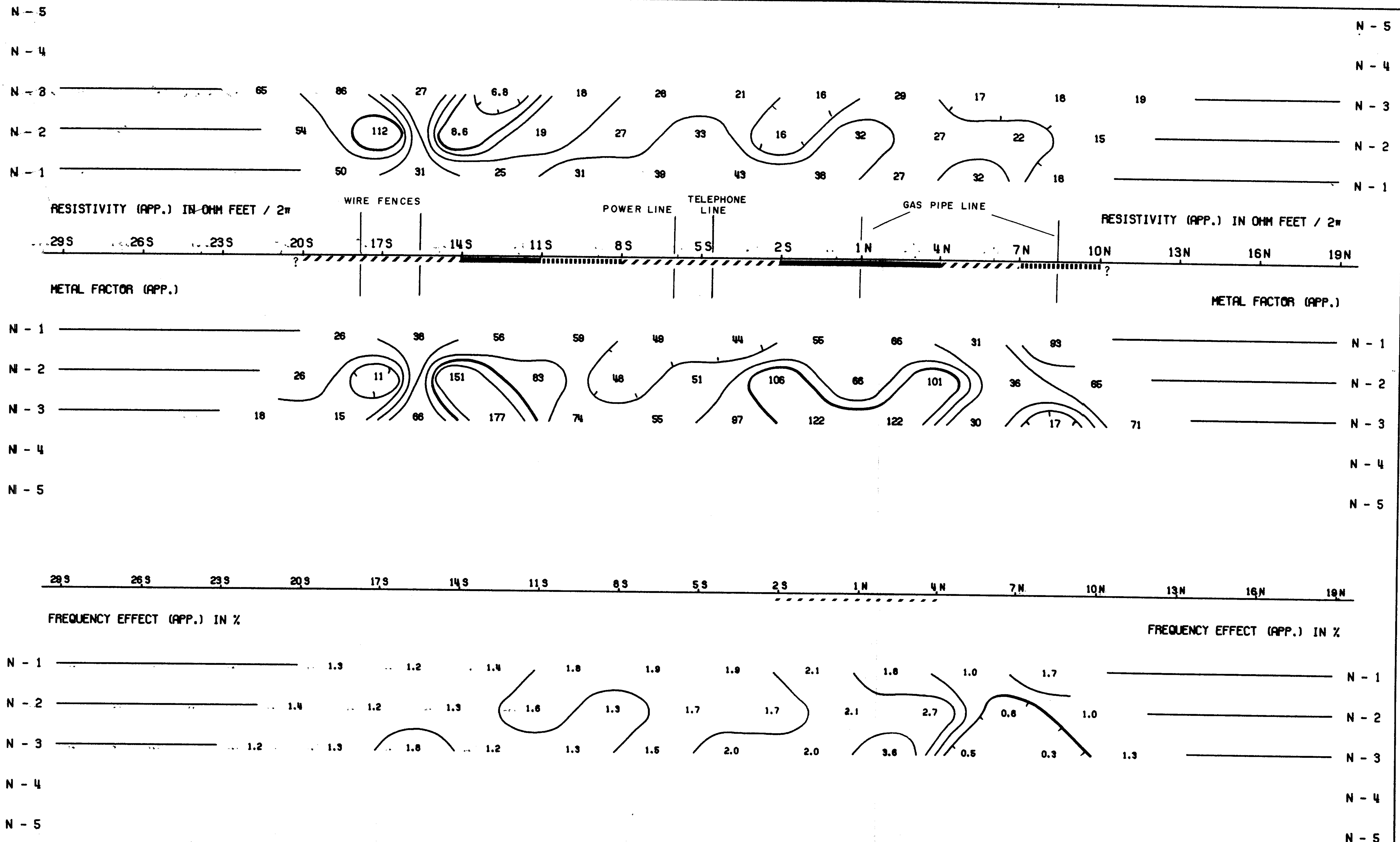
PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA PHILIP G. HALLOF

Expiry Date: February 25, 1973

# McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



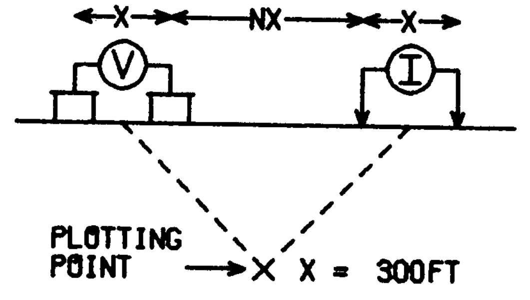

DWG. NO.- I.P.-5976-6

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA, KAMLOOPS M.D., B.C.

LINE NO.- 2000E

ELECTRODE CONFIGURATION




SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUN 1972

APPROVED

DATE 29/8/72

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

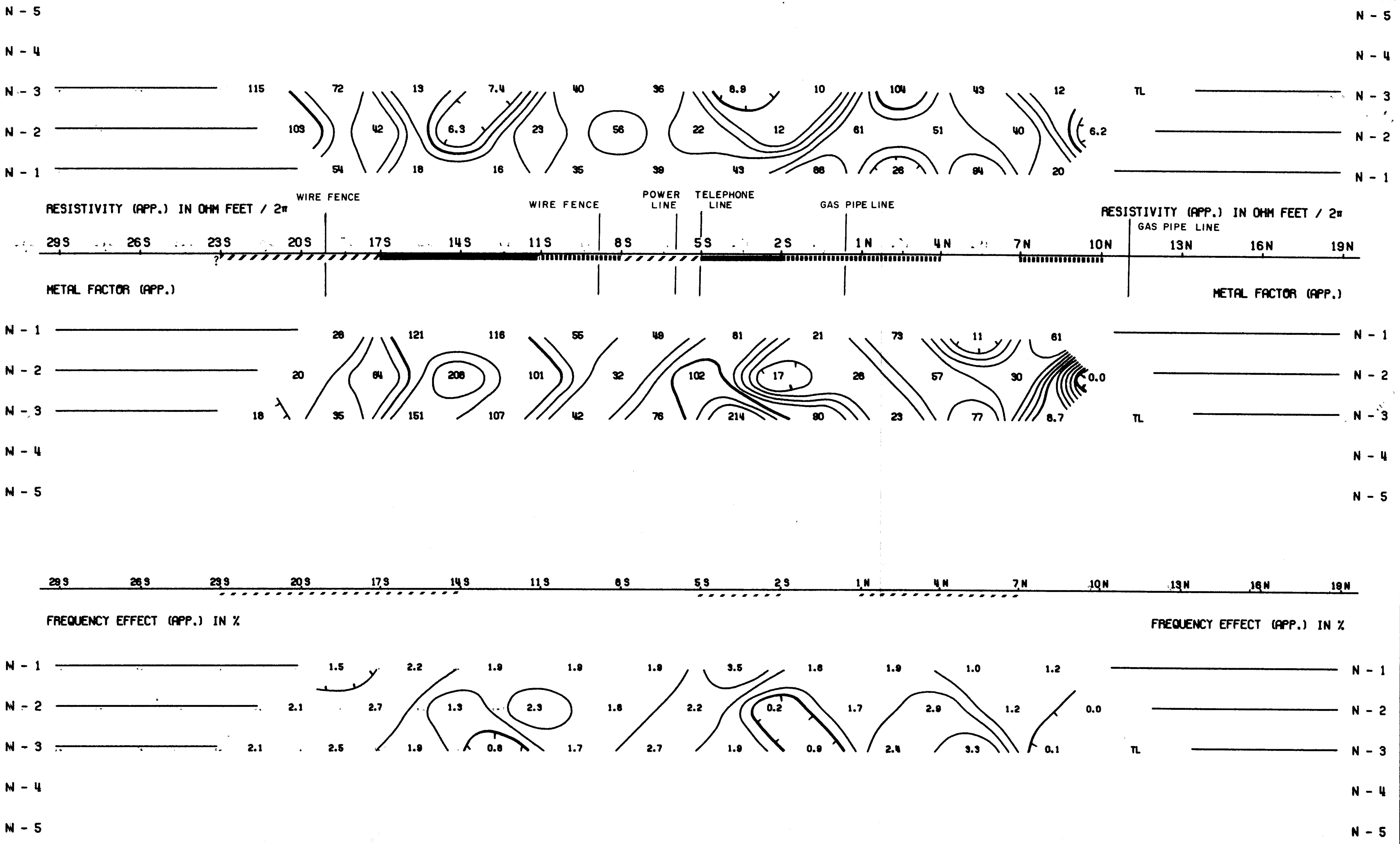
PROFESSIONAL ENGINEER, PROVINCE OF BRITISH COLUMBIA — P. G. HALLOF

Expiry Date: February 25, 1973

## McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



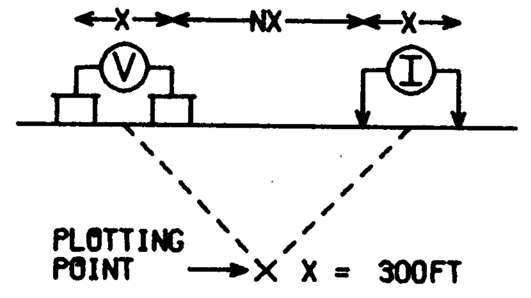

DWG. NO.- I.P.-5976-7

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 2400E

ELECTRODE CONFIGURATION




SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: ... 1972

APPROVED:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

DATE: 29/8/72

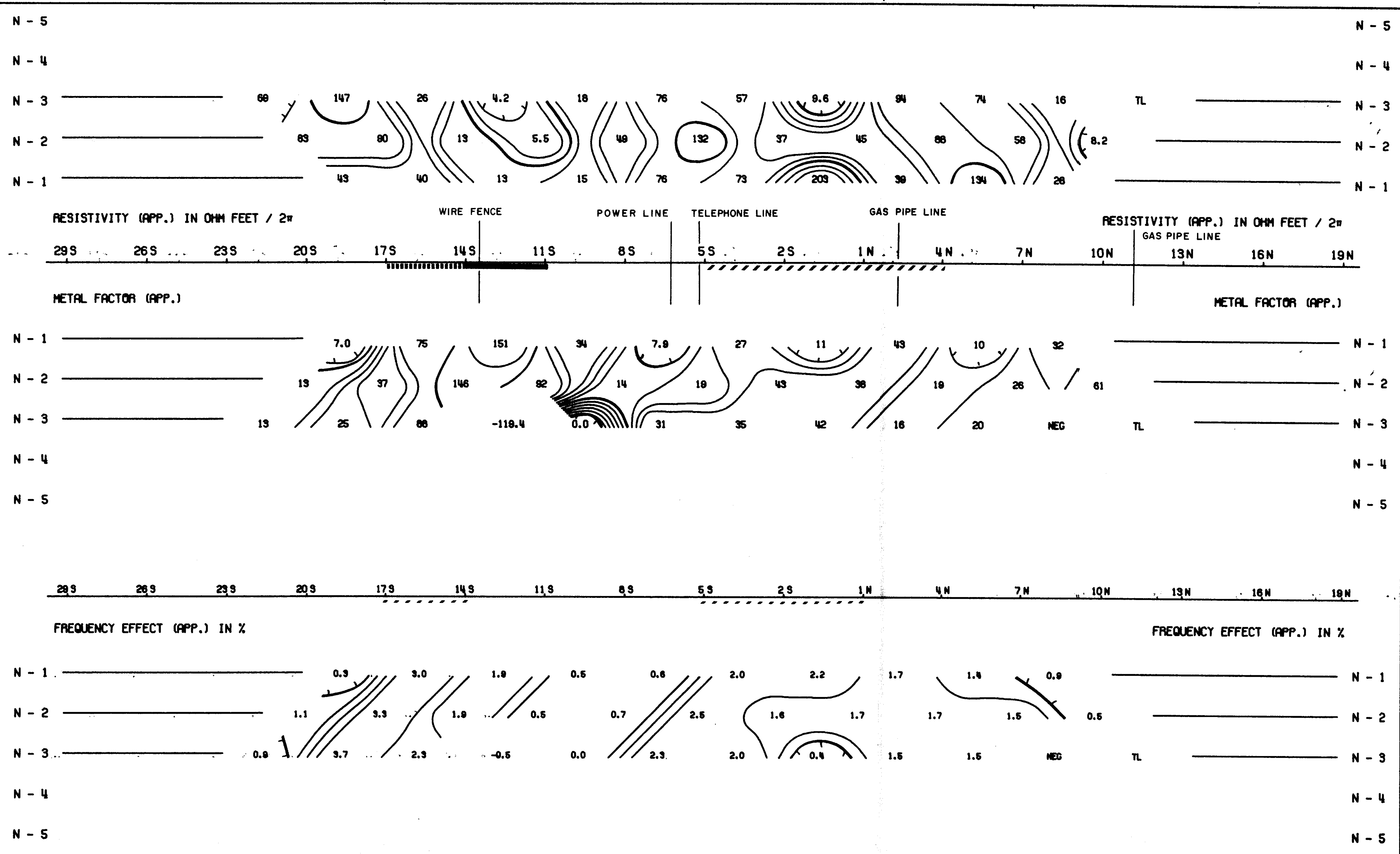
PROFESSIONAL ENGINEER, PROVINCE OF BRITISH COLUMBIA

Expiry Date: February 25, 1973

# McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY McPHAR COMPUTER DIVISION




DWG. NO.- I.P.-5976-8

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 2800E

ELECTRODE CONFIGURATION

PLOTTING POINT → X  X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUN 1972

APPROVED:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

DATE:

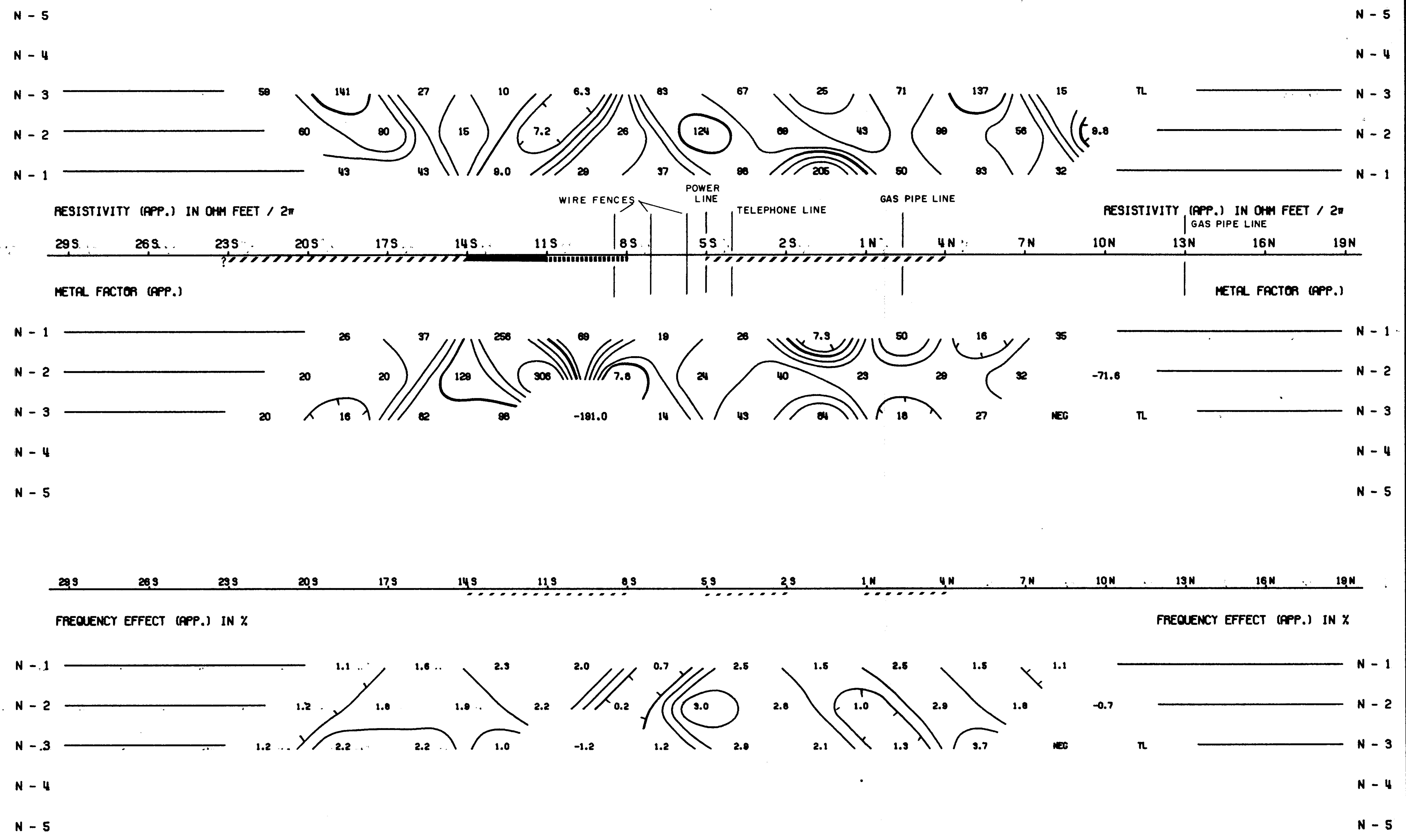
PROFESSIONAL ENGINEER, PROVINCE OF BRITISH COLUMBIA

Expiry Date: February 25, 1973

## McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY McPHAR COMPUTER DIVISION




DWG. NO.- I.P.-5976-9

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 3200E

ELECTRODE CONFIGURATION

PLOTTING POINT X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: ... 1972

APPROVED:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

DATE:

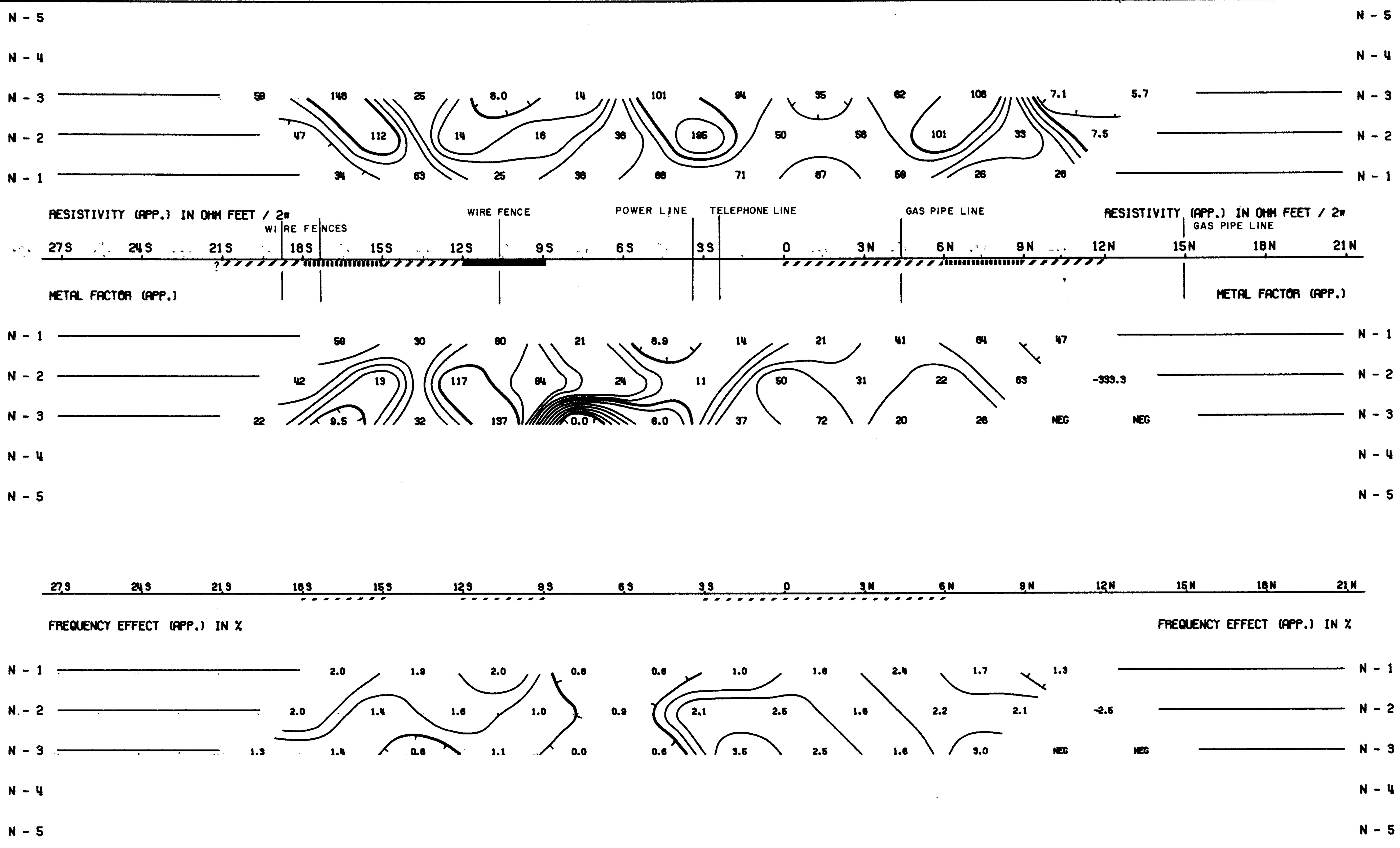
PROVINCE OF BRITISH COLUMBIA PROFESSIONAL ENGINEER

Expiry Date: February 25, 1973

## McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY McPHAR COMPUTER DIVISION




DWG. NO.- I.P.-5976-10

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 3600E

ELECTRODE CONFIGURATION

PLOTTING POINT X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES
DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: ... 1972

APPROVED:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

DATE:

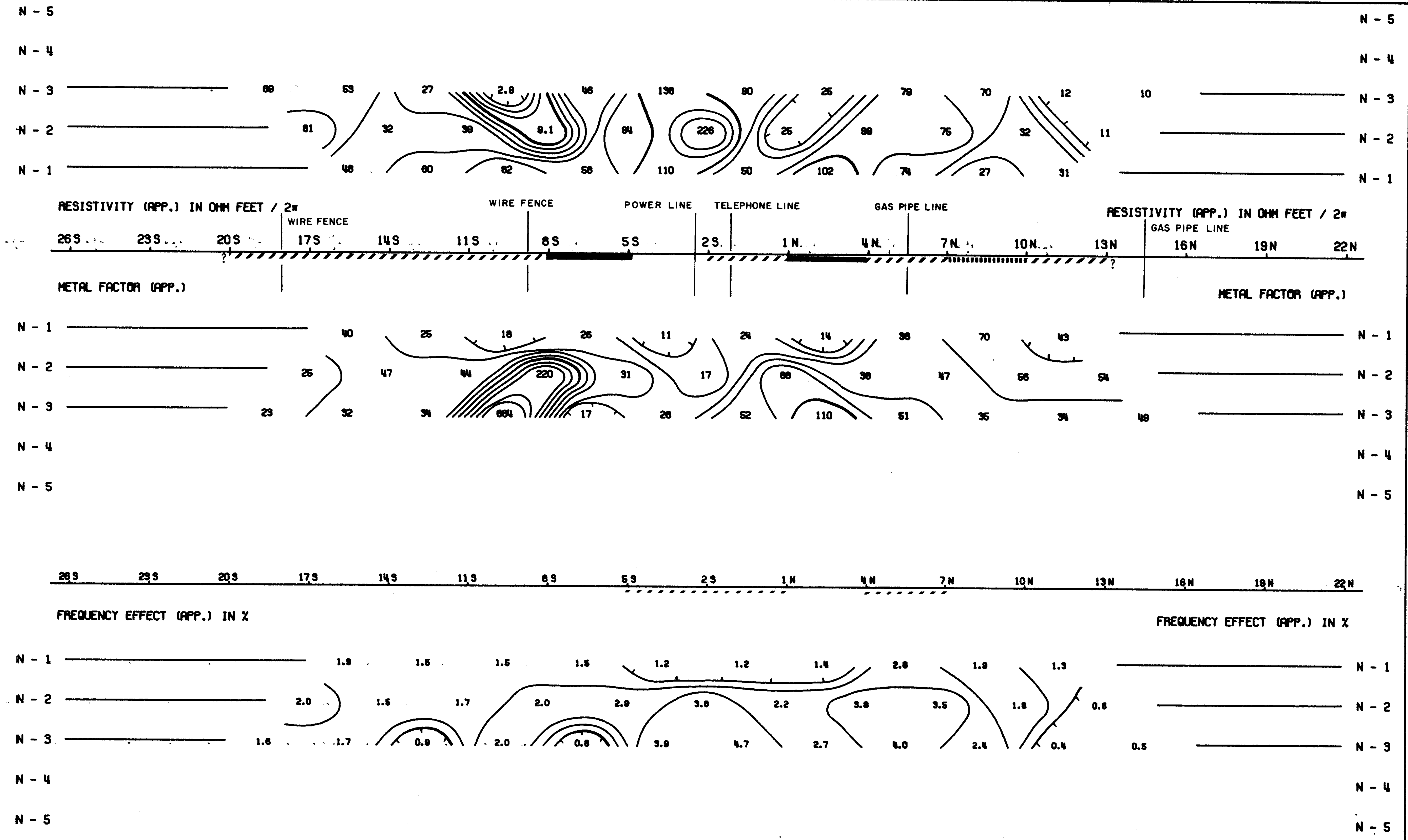
PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA PHILIP G. KALLOF

Expiry Date: February 25, 1973

## McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION




DWG. NO.- I.P.-5976-11

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 4000E

ELECTRODE CONFIGURATION

PLOTTING POINT X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JAN. 1972

APPROVED:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

DATE: Feb 8/72

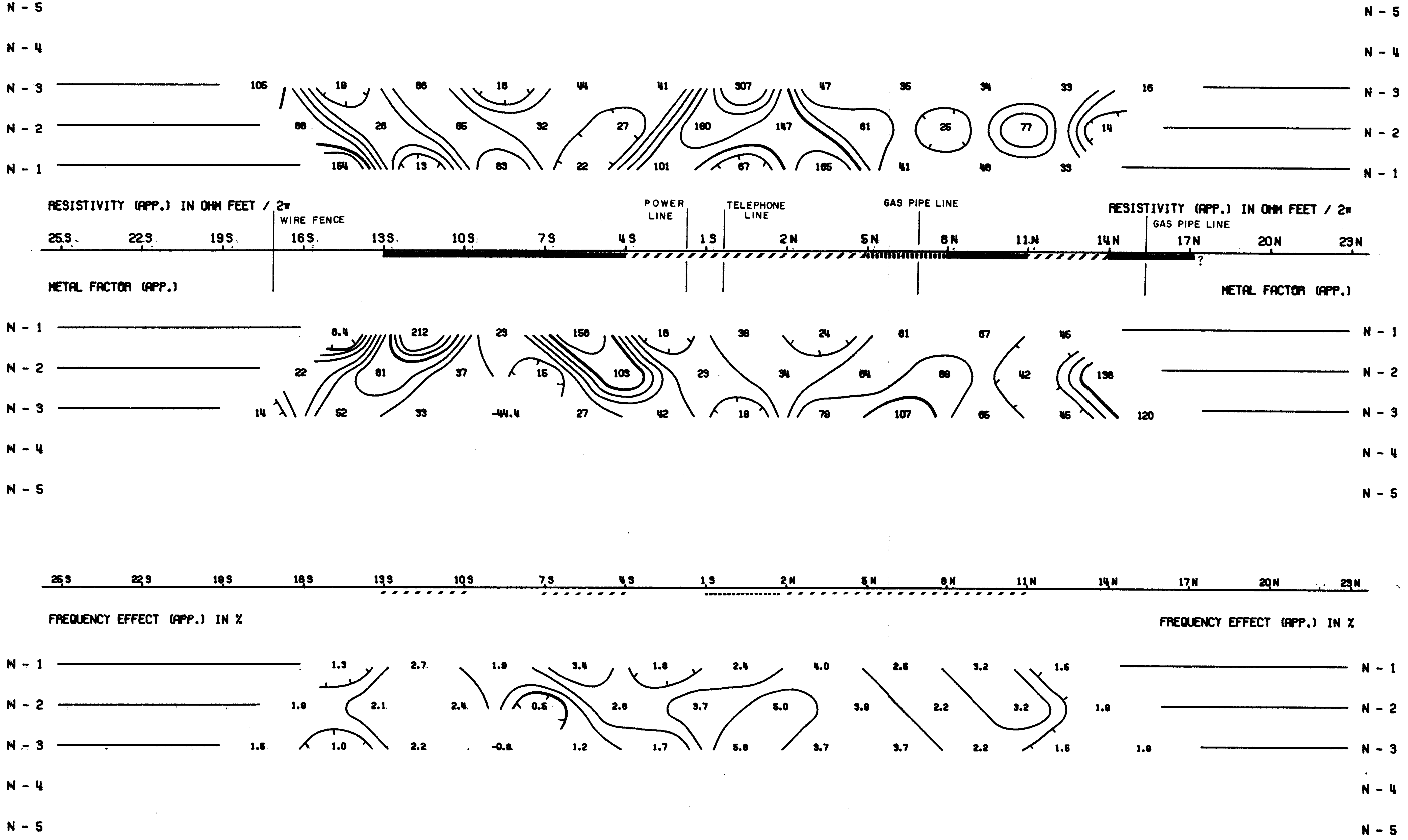
PROVINCE OF BRITISH COLUMBIA PROFESSIONAL ENGINEER

Expiry Date: February 25, 1973

## McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION




DWG. NO.- I.P.-5976-12

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA, KAMLOOPS M.D., B.C.

LINE NO.- 4400E

ELECTRODE CONFIGURATION

PLOTTING POINT → X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUN 1972

APPROVED:

DATE:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

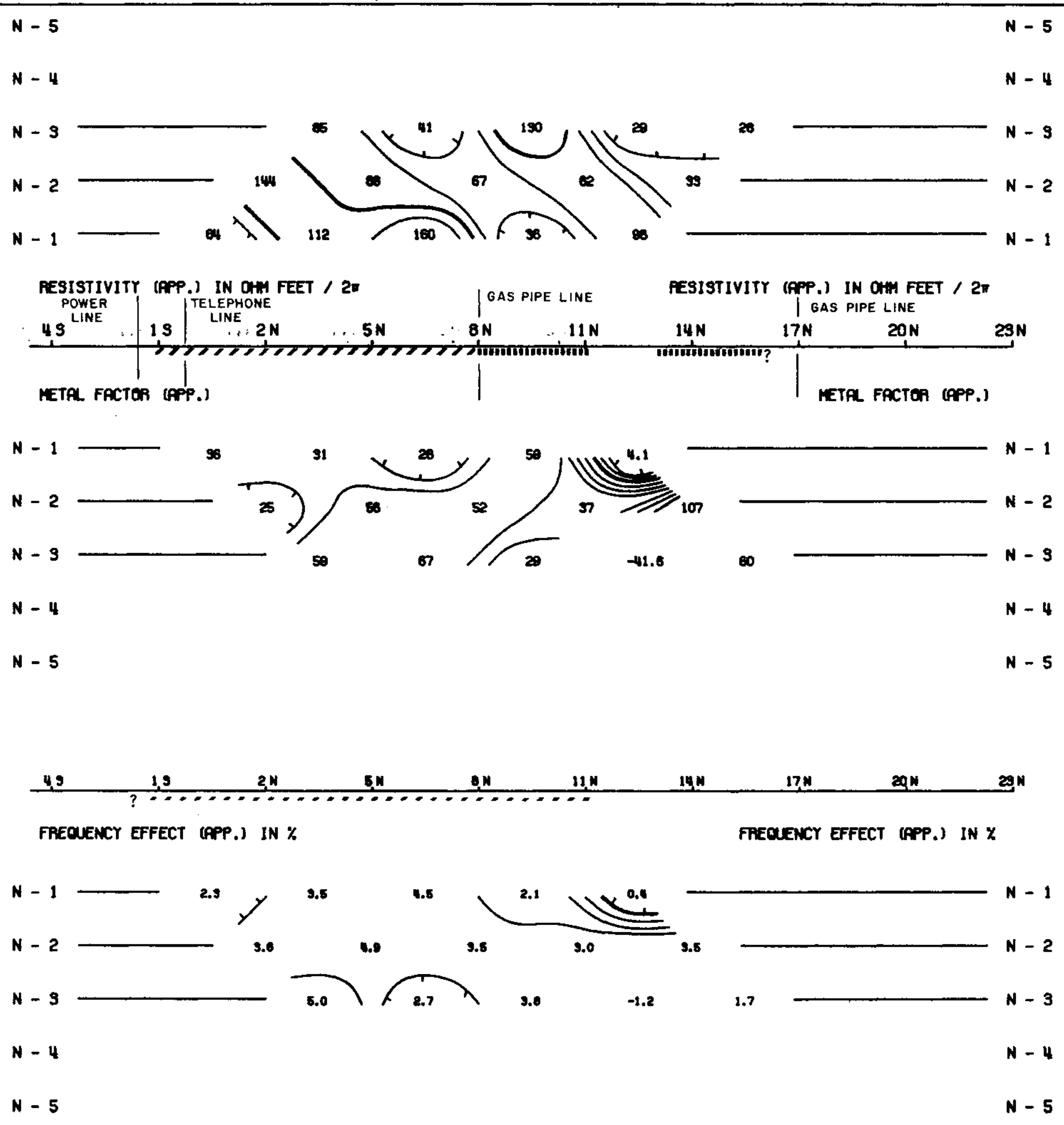
PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA

Expiry Date: February 25, 1973

## McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY McPHAR COMPUTER DIVISION



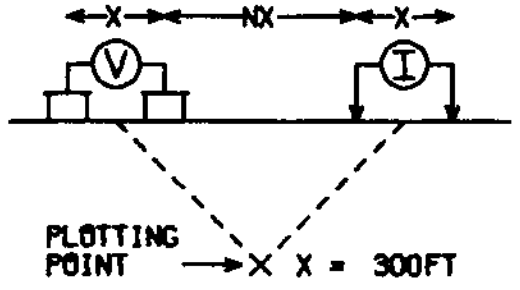

DWG. NO.- I.P.-5976-13

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 4800E

ELECTRODE CONFIGURATION




SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUN 1972

APPROVED:

DATE:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1,-1.5-2,-3,-5,-7.5-10

PROFESSIONAL ENGINEER, PROVINCE OF BRITISH COLUMBIA, PHILIP G. HALLOF

Expiry Date: February 25, 1973

# McPHAR GEOPHYSICS

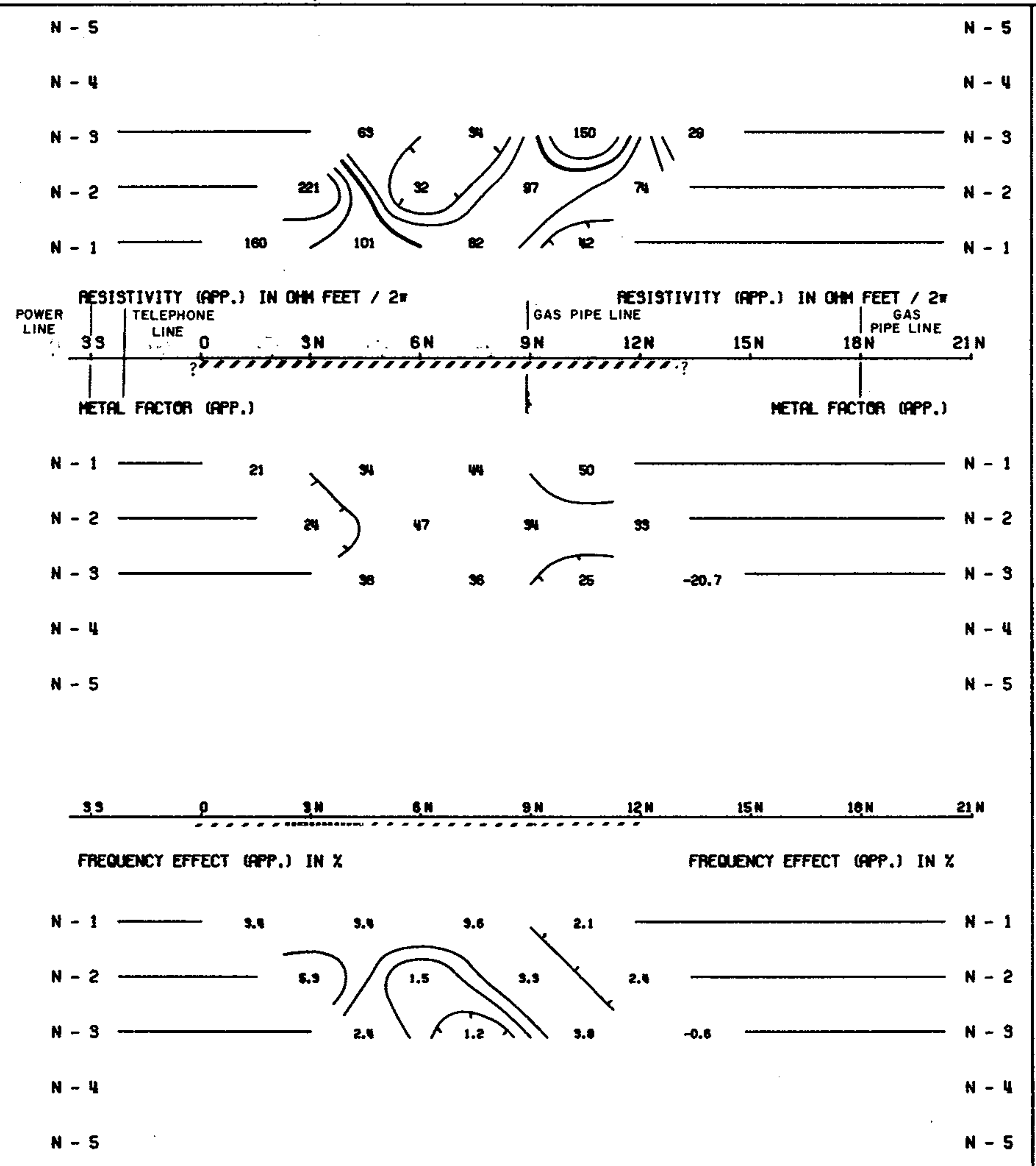
INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION

DWG. NO.- I.P.-5976-14

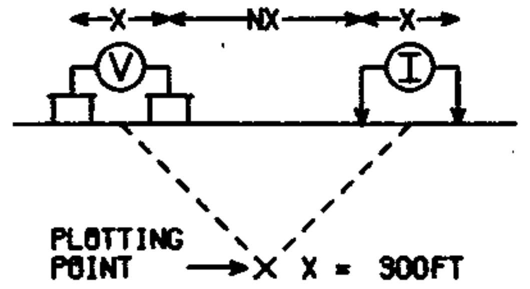
# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.




LINE NO.- 5200E

ELECTRODE CONFIGURATION




SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUL 1972

APPROVED:

DATE:

PROFESSIONAL ENGINEER, PROVINCE OF BRITISH COLUMBIA, PHILIP G. HALLOF

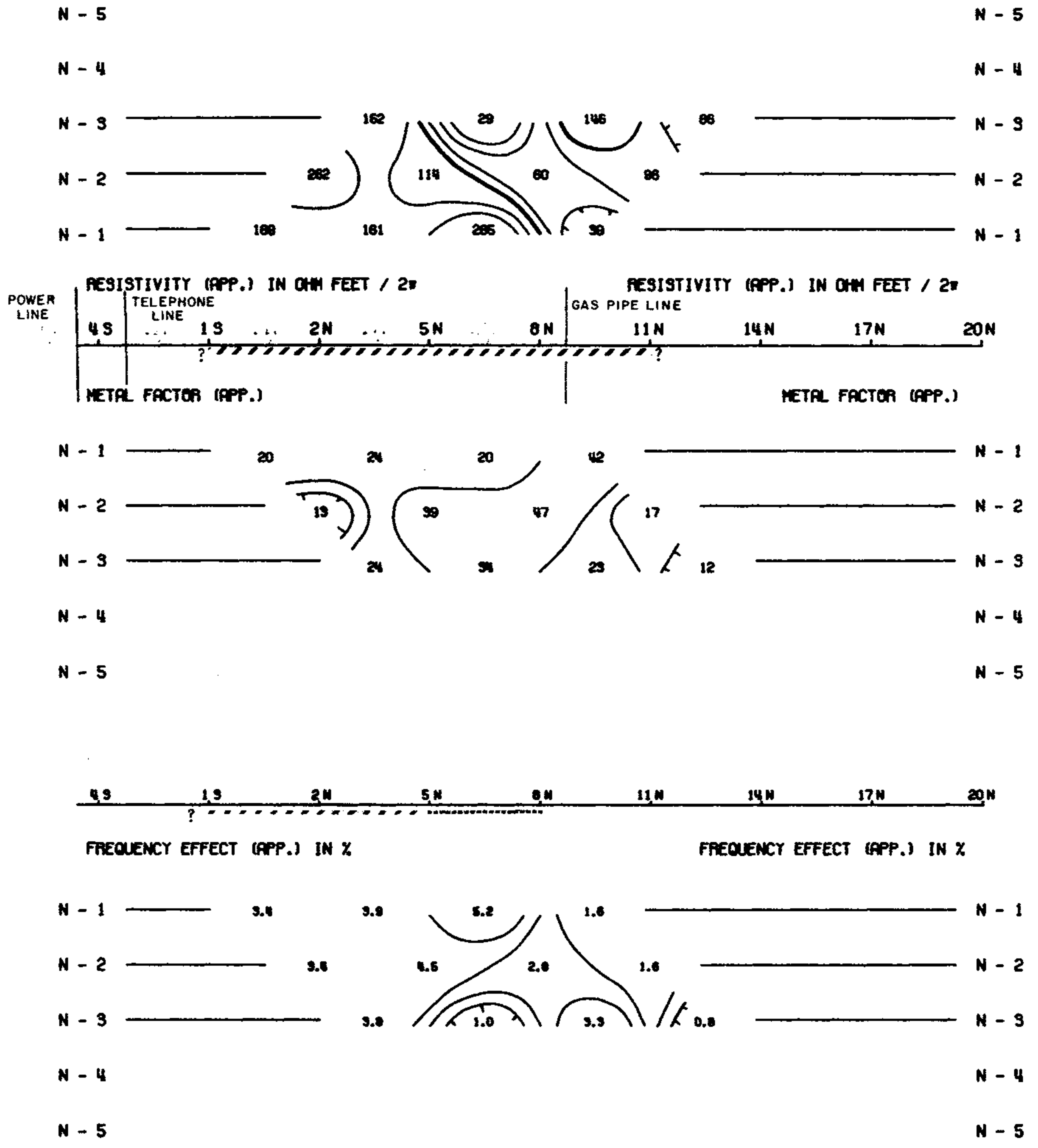
Expiry Date: February 25, 1973

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

## McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



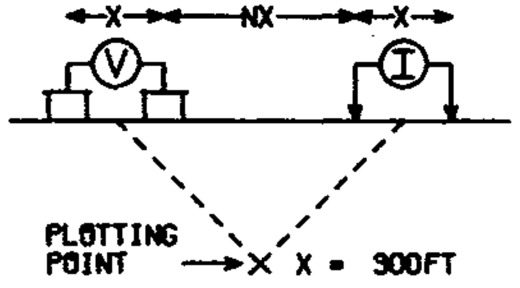

DWG. NO.- I.P.-5976-15

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 5600E

ELECTRODE CONFIGURATION




SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE ▬▬▬
PROBABLE ||||||||||
POSSIBLE /////

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUL 1972

APPROVED: Philip G. Hallof

DATE: Aug 8/72

PROFESSIONAL ENGINEER, PROVINCE OF BRITISH COLUMBIA, P. G. HALLOF

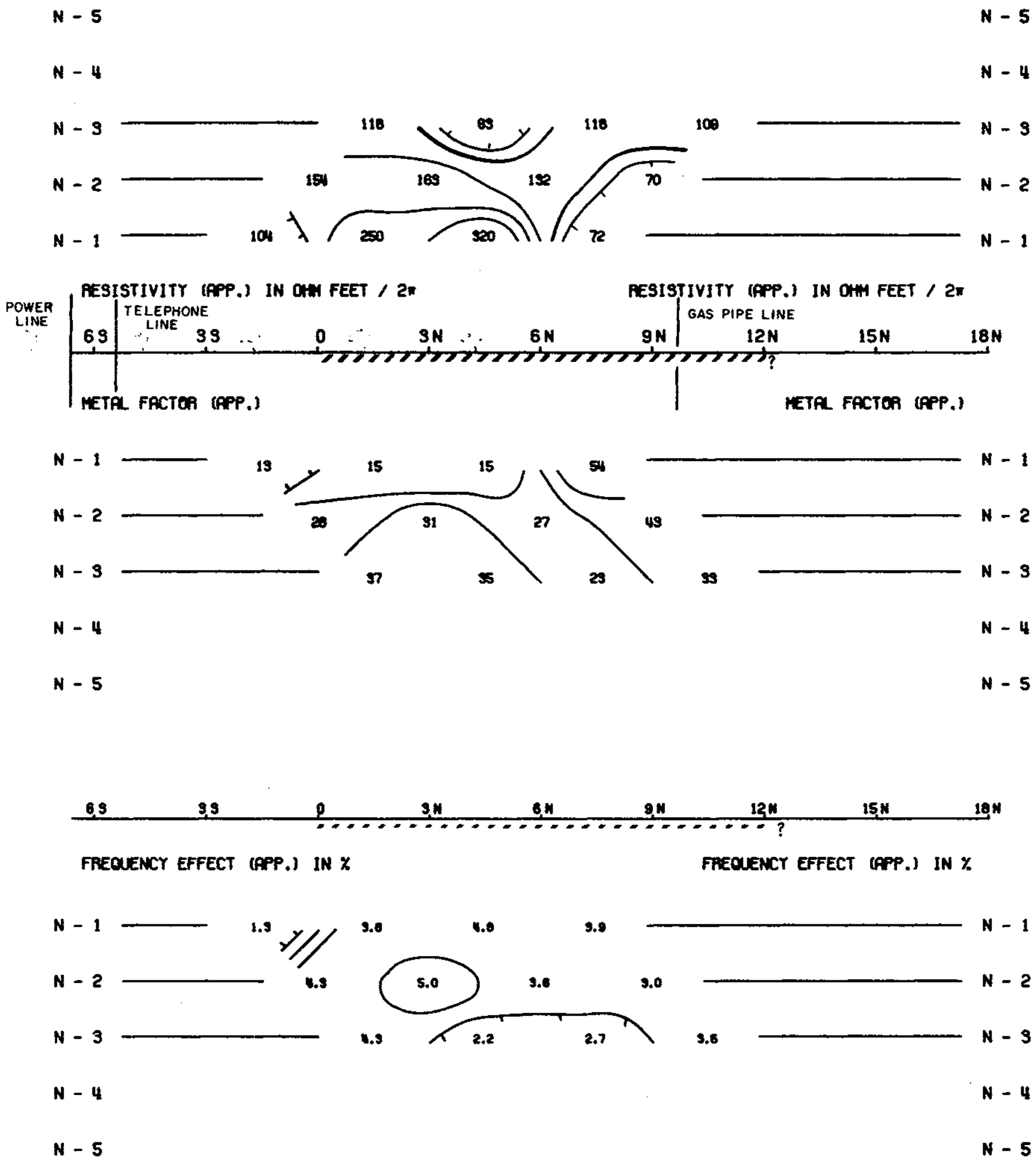
Expiry Date: February 25, 1973

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

# McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



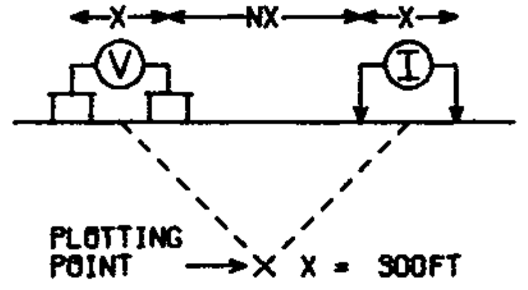

DWG. NO.- I.P.-5976-16

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 6000E

ELECTRODE CONFIGURATION




SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUL 1972

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1,-1.5-2,-3,-5,-7.5-10

APPROVED: Philip G. Hallof

DATE: 24/8/72

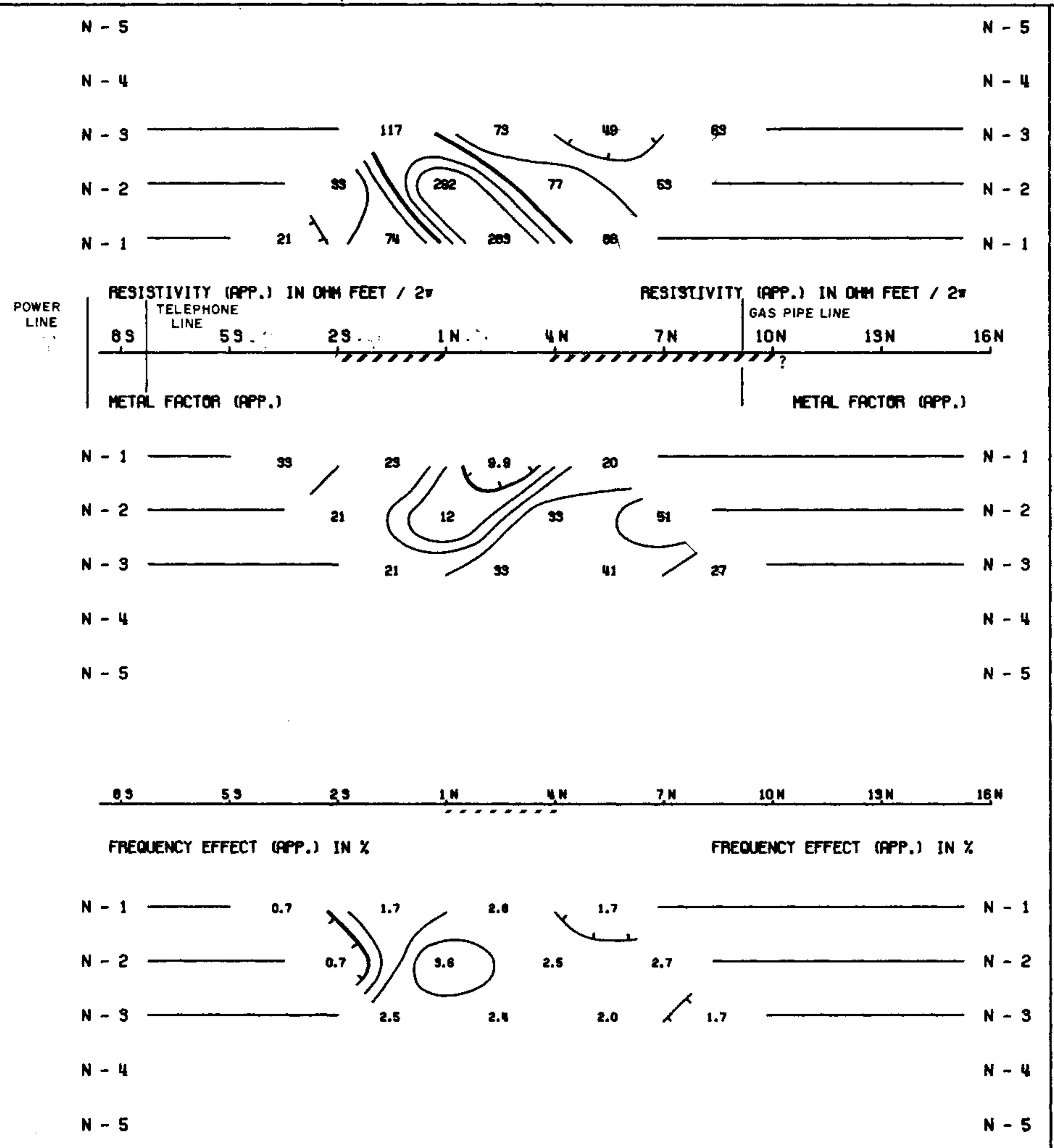
PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
PHILIP G. HALLOF

Expiry Date: February 25, 1973

# McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



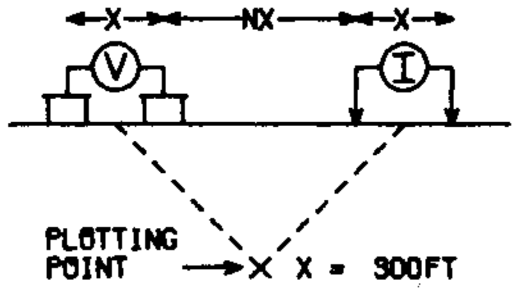

DWG. NO.- I.P.-5976-17

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 6400E

ELECTRODE CONFIGURATION




SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: ... 1972

APPROVED:

DATE:

PROFESSIONAL ENGINEER, PROVINCE OF BRITISH COLUMBIA — PHILIP G. HALLOF

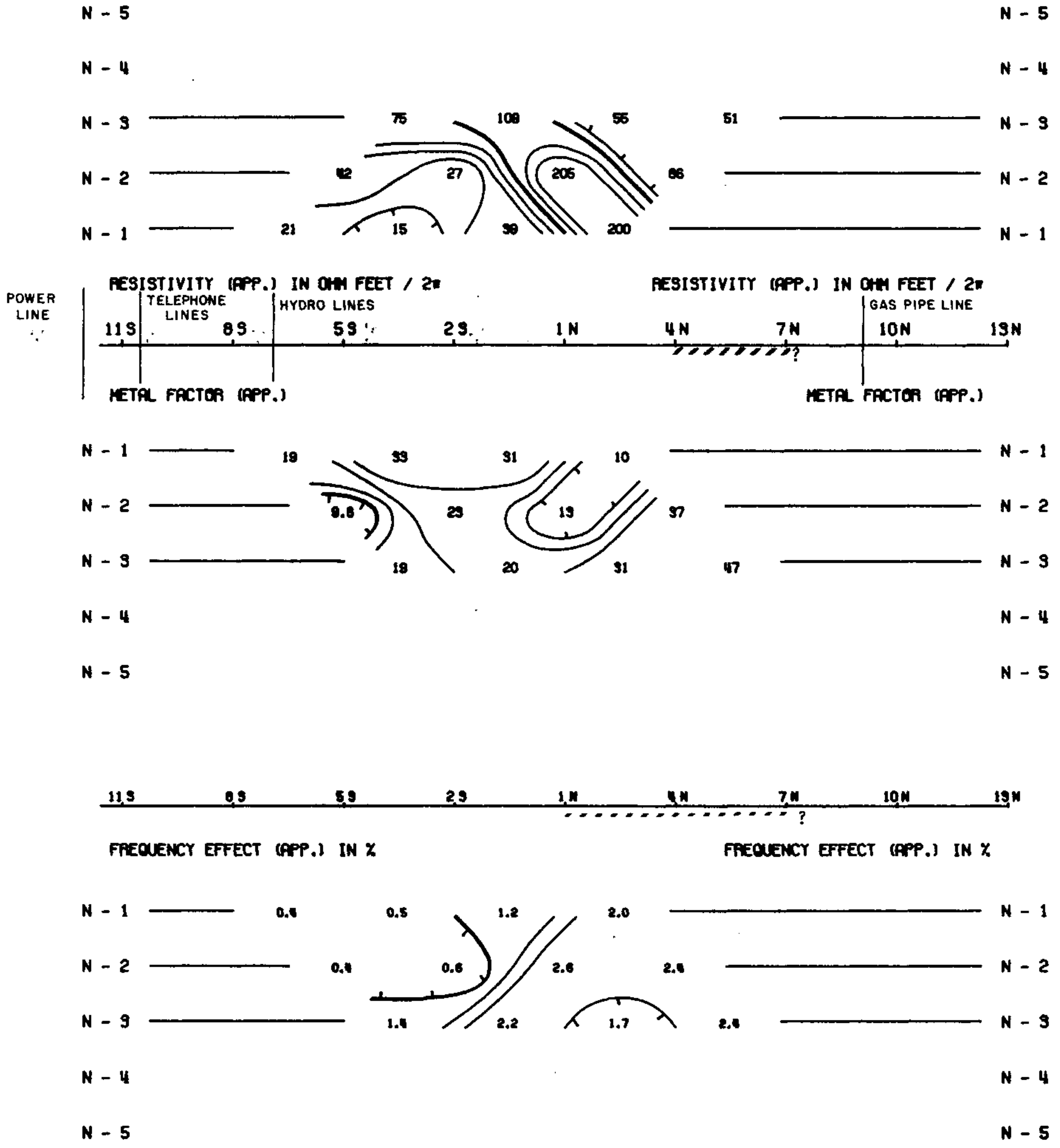
Expiry Date: February 25, 1973

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

# McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



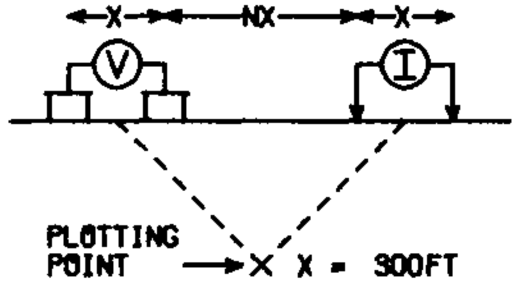

DWG. NO.- I.P.-5976-18

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 6800E

ELECTRODE CONFIGURATION




SURFACE PROJECTION
OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUL 1972

APPROVED:

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA

DATE: 29/8/72

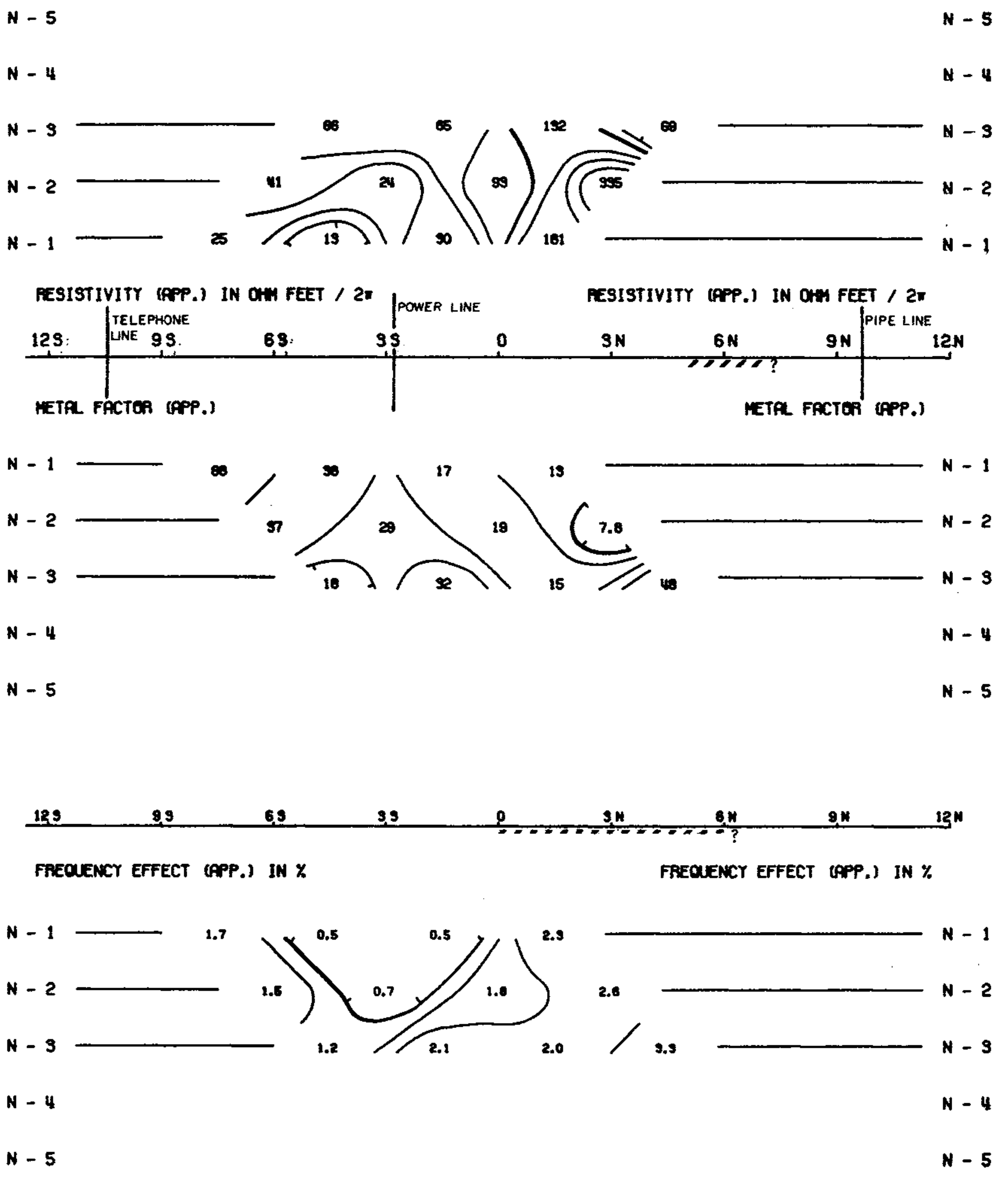
Expiry Date: February 25, 1973

NOTE: CONTOURS AT LOGARITHMIC INTERVALS
1.-1.5-2.-3.-5.-7.5-10

## McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION




DWG. NO.- I.P.-5976-19

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 7200E

ELECTRODE CONFIGURATION

PLOTTING POINT X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: ... 1972

APPROVED:

DATE:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

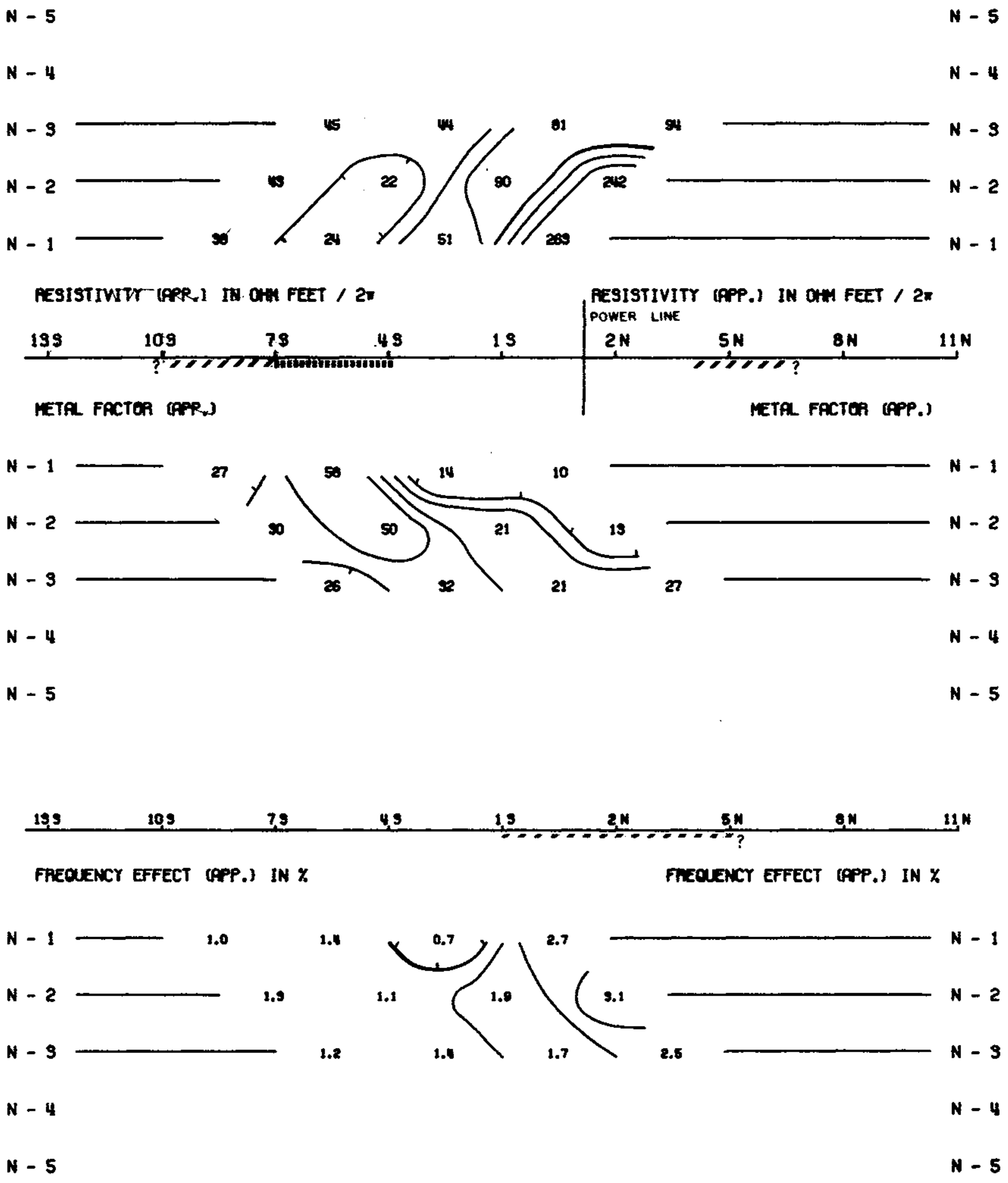
PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA PHILIP G. HALLOF

Expiry Date: February 25, 1973

# McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



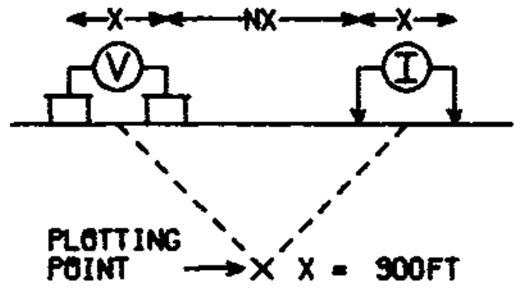

DWG. NO.- I.P.-5976-20

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 7600E

ELECTRODE CONFIGURATION




SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUL 1972

APPROVED:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

DATE:

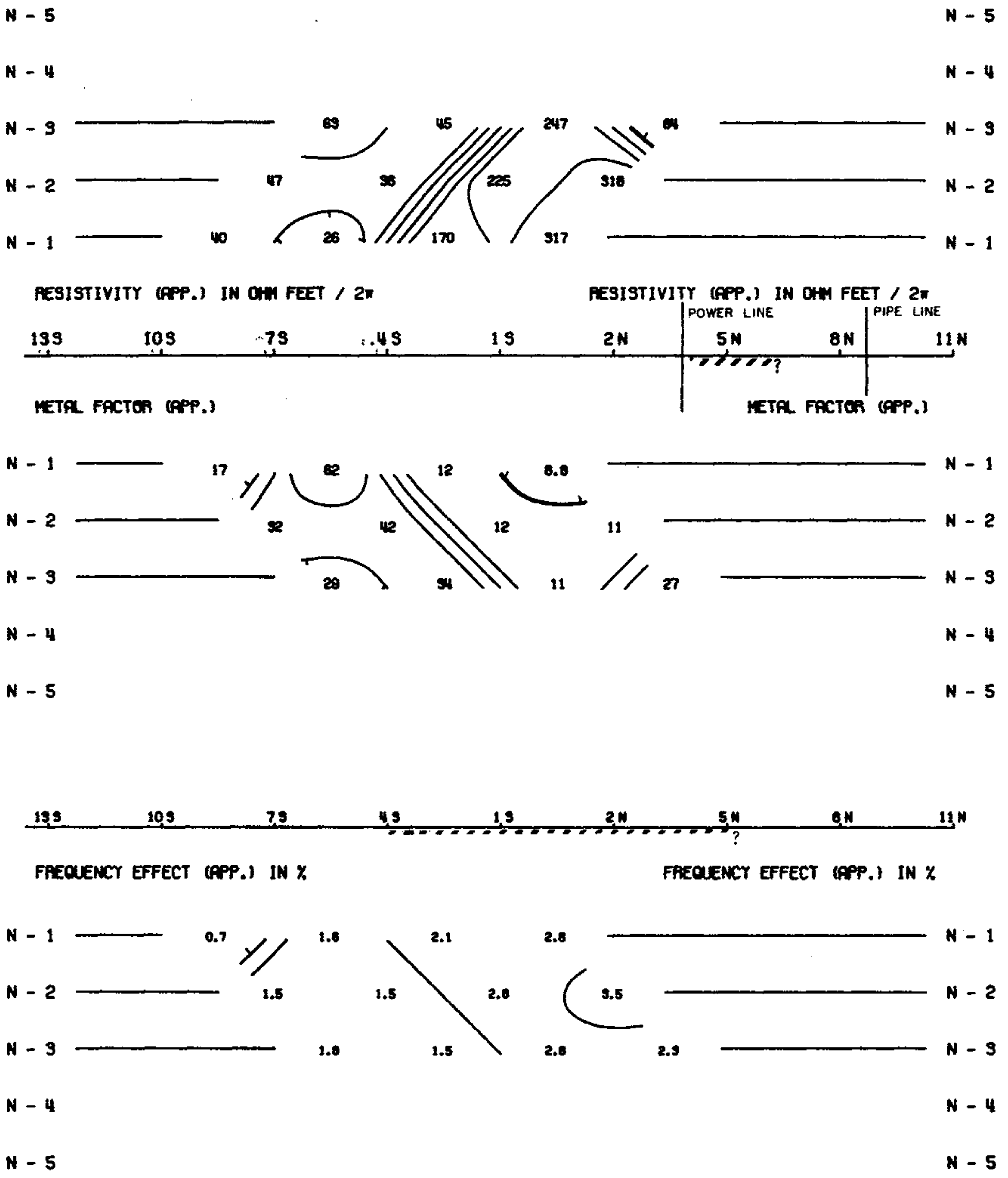
PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
PHILIP G. HALLOF

Expiry Date: February 25, 1978

# McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION




DWG. NO. - I.P. - 5976-21

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO. - 8000E

ELECTRODE CONFIGURATION

PLOTTING POINT X = 500FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: ... 1972

APPROVED:

DATE:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS
1.-1.5-2.-3.-5.-7.5-10

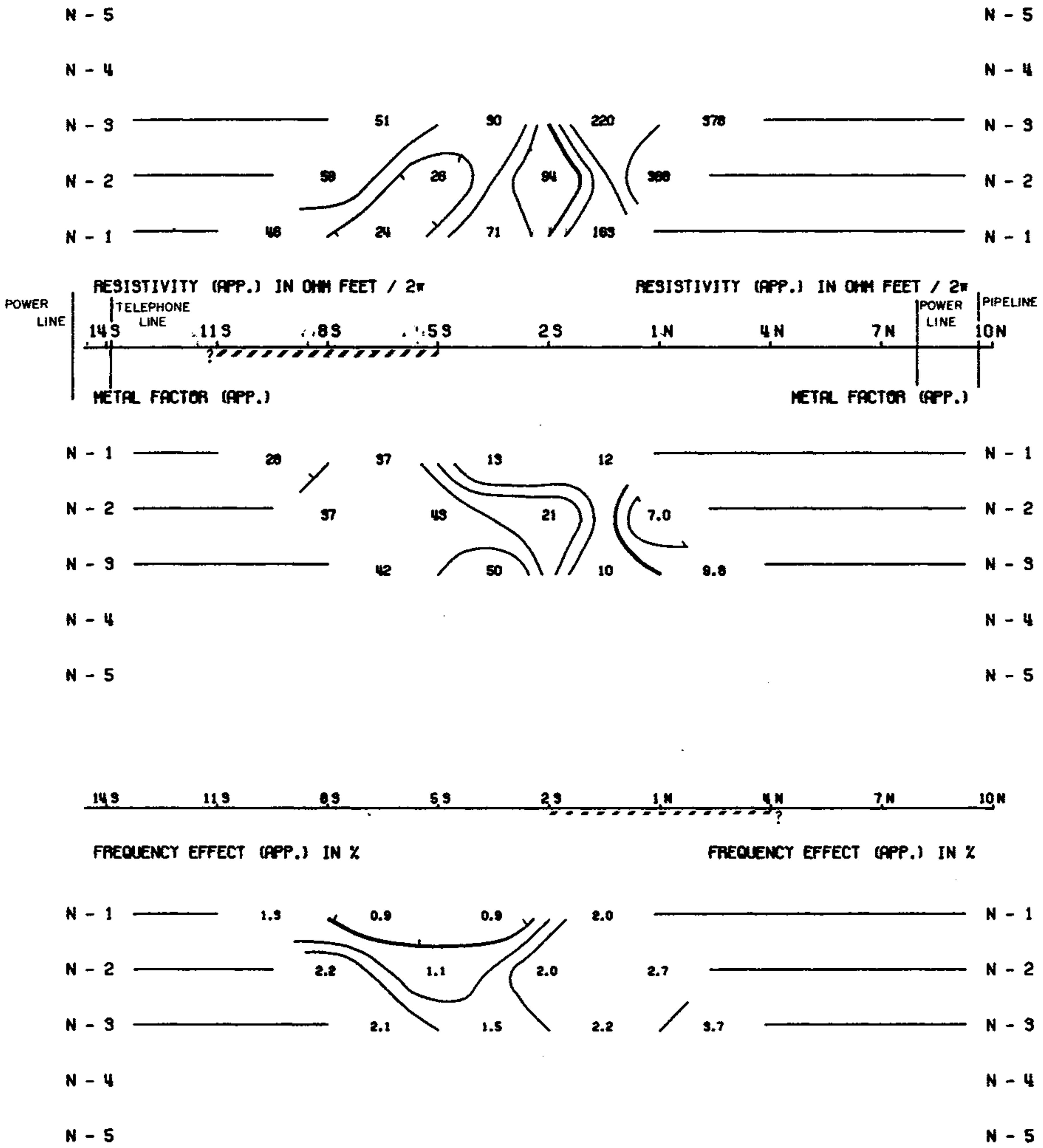
PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA

Expiry Date: February 25, 1973

# McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION

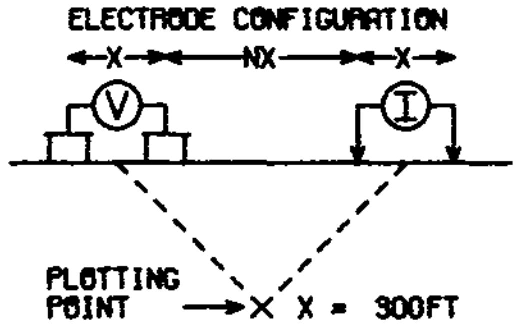



DWG. NO.- I.P.-5976-22

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 8400E




SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUL 1972

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

APPROVED:

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — PHILIP G. HALLOF

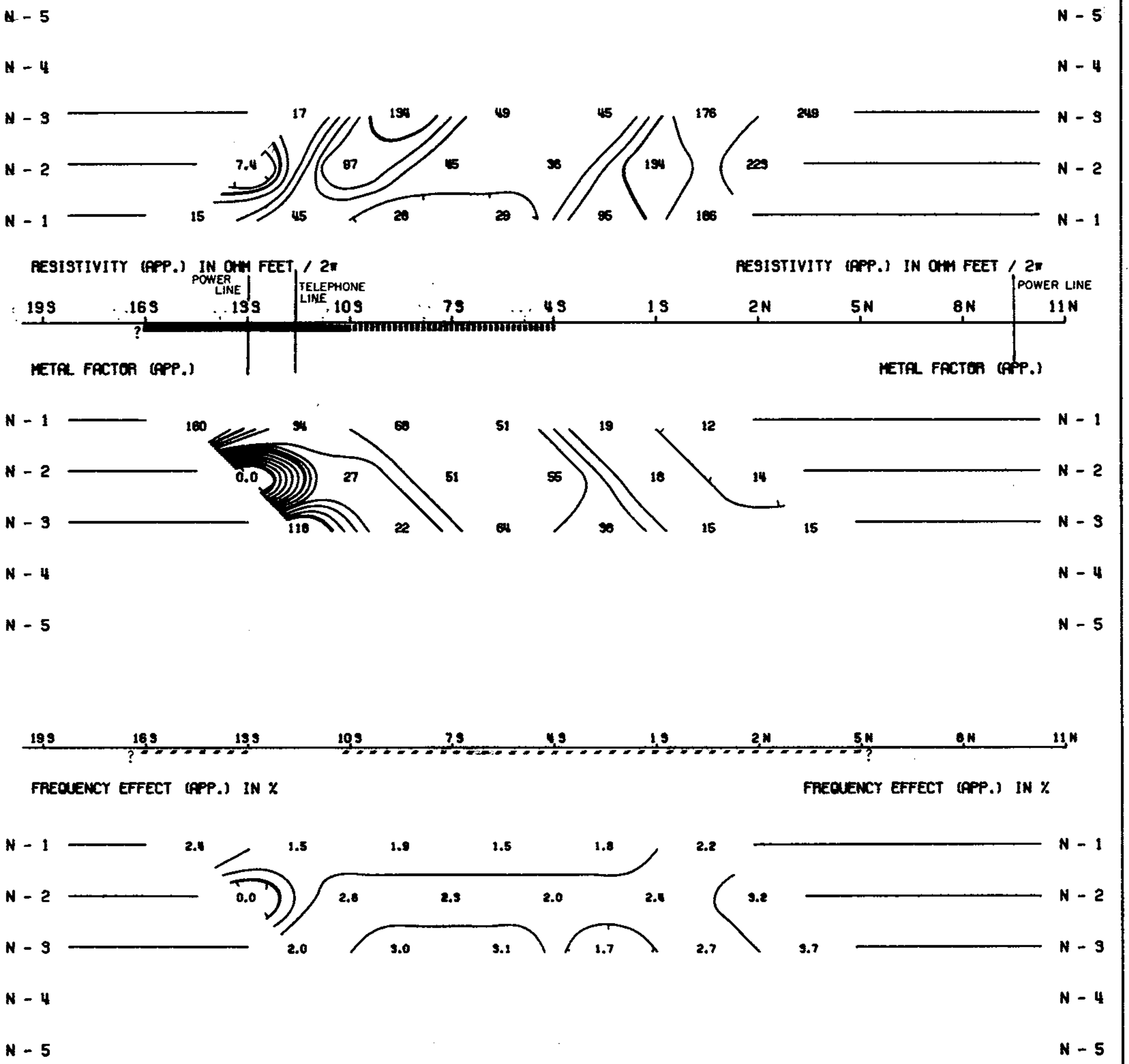
DATE:

Expiry Date: February 2? 1973

# McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



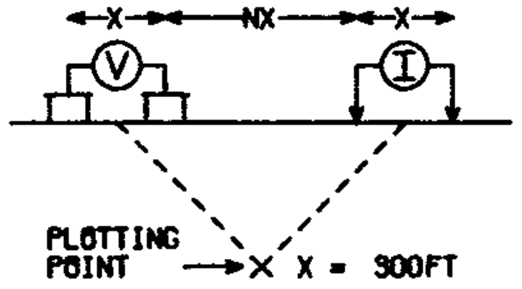

DWG. NO.- I.P.-5976-23

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 8800E

ELECTRODE CONFIGURATION




SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: 1972

APPROVED:

DATE:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

PROFESSIONAL ENGINEER, PROVINCE OF BRITISH COLUMBIA

Expiry Date: February 25, 1973

## McPHAR GEOPHYSICS

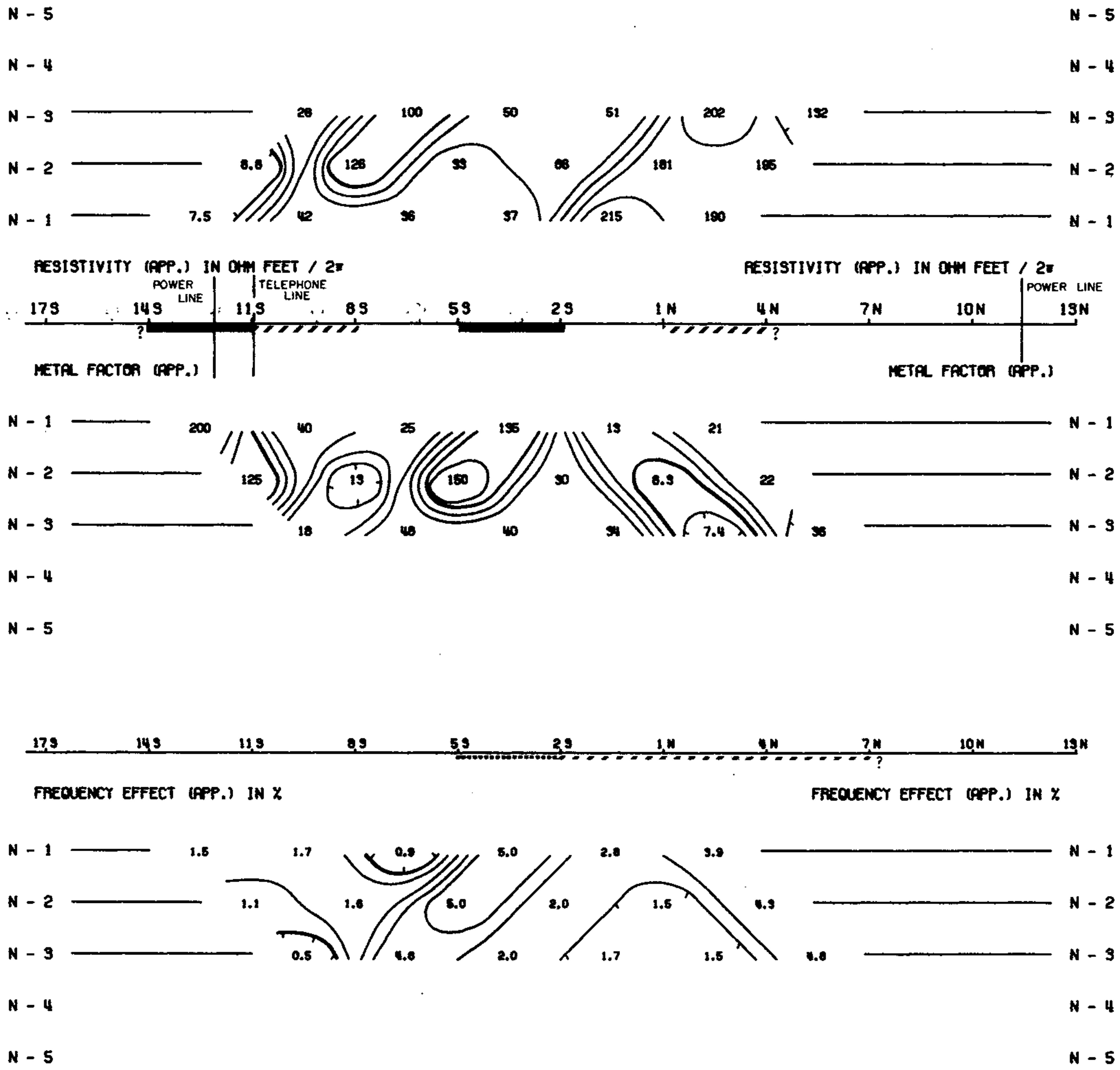
INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION

DWG. NO.- I.P.-5976-24

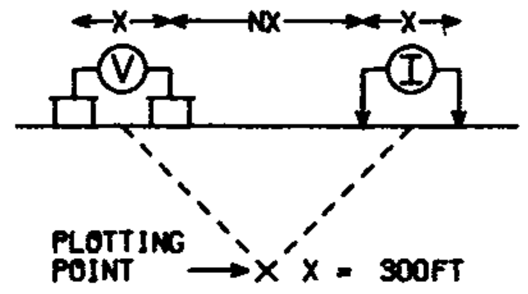
# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.




LINE NO.- 9200E

ELECTRODE CONFIGURATION




SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUL 1972

APPROVED

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA PHILIP G. HALLOF

DATE: 29/12/72

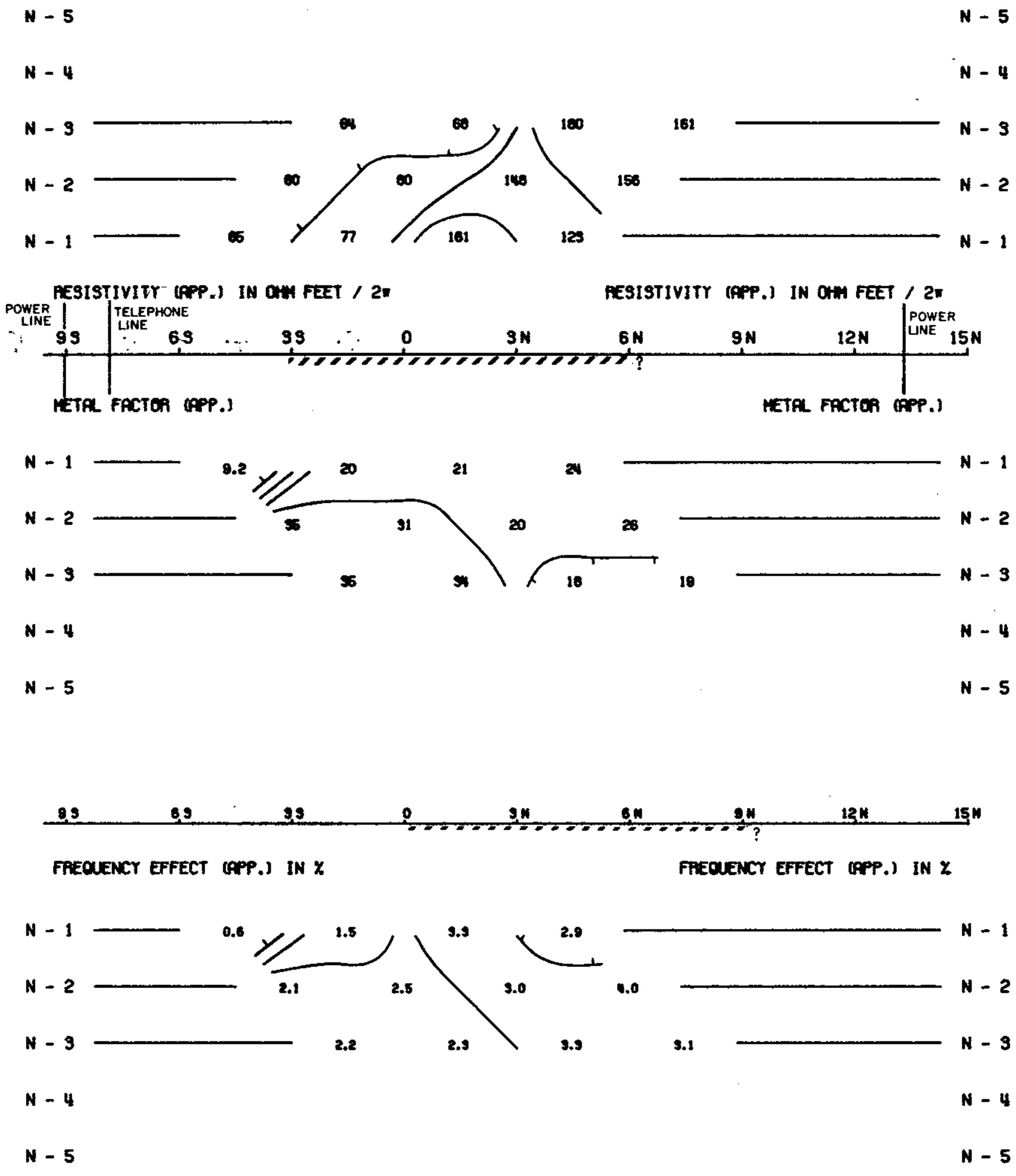
Expiry Date: February 25, 1973

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

# McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



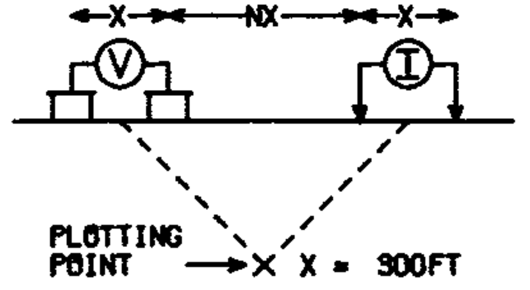

DWG. NO.- I.P.-5976-25

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 9600E

ELECTRODE CONFIGURATION




SURFACE PROJECTION OF ANOMALOUS ZONES
DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUL 1972

APPROVED:

DATE:

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — PHILIP G. HALLOF

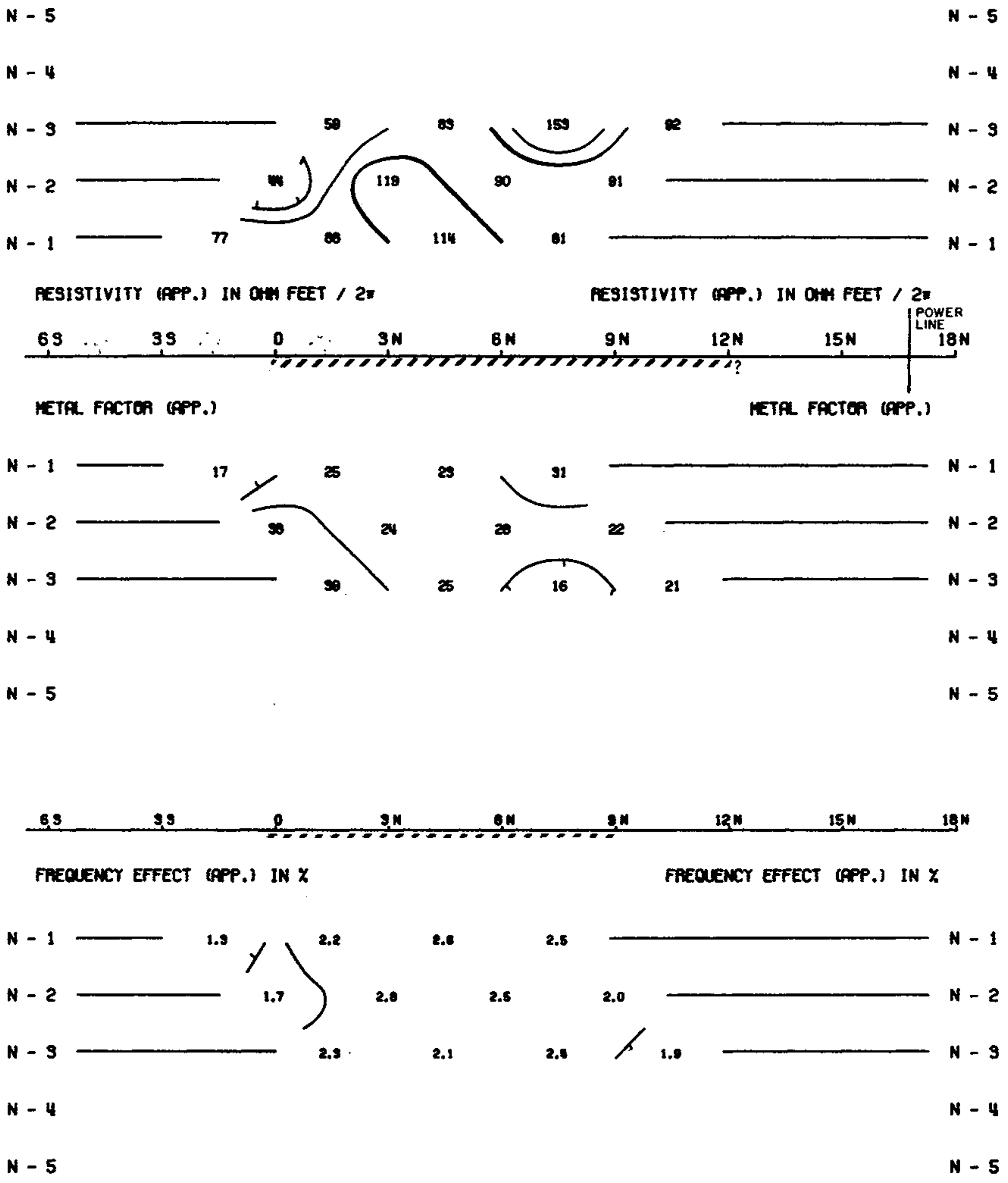
Expiry Date: February 25, 1973

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

# McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION




DWG. NO.- I.P.-5976-26

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 10000E

ELECTRODE CONFIGURATION

X — NX — X

V I

PLOTTING POINT X X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: 1972

APPROVED:

DATE:

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA

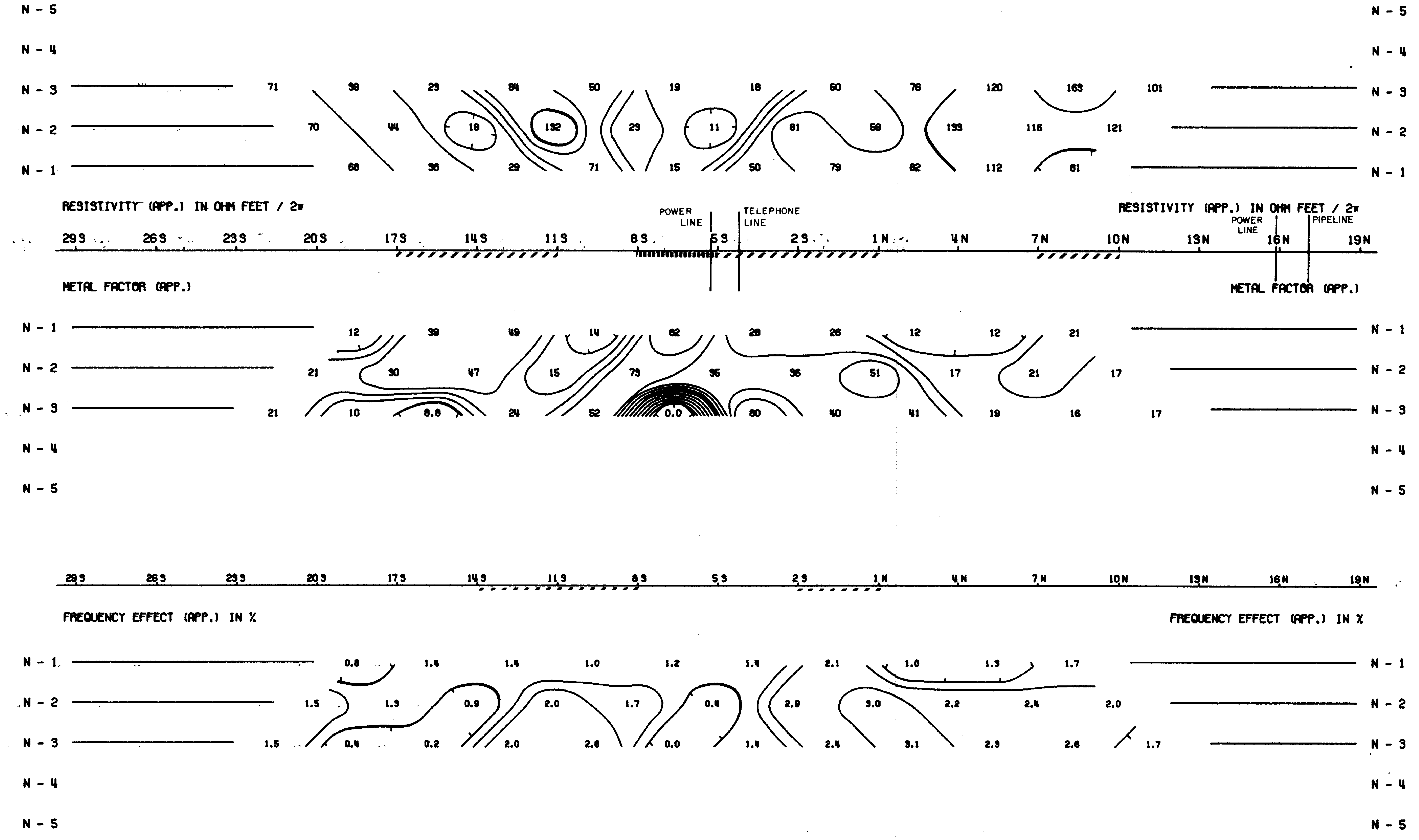
Expiry Date: February 25, 1973

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

# McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION




DWG. NO.- I.P.-5976-27

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 10400E

ELECTRODE CONFIGURATION

PLOTTING POINT → X  X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES
DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUL 1972

APPROVED

DATE

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

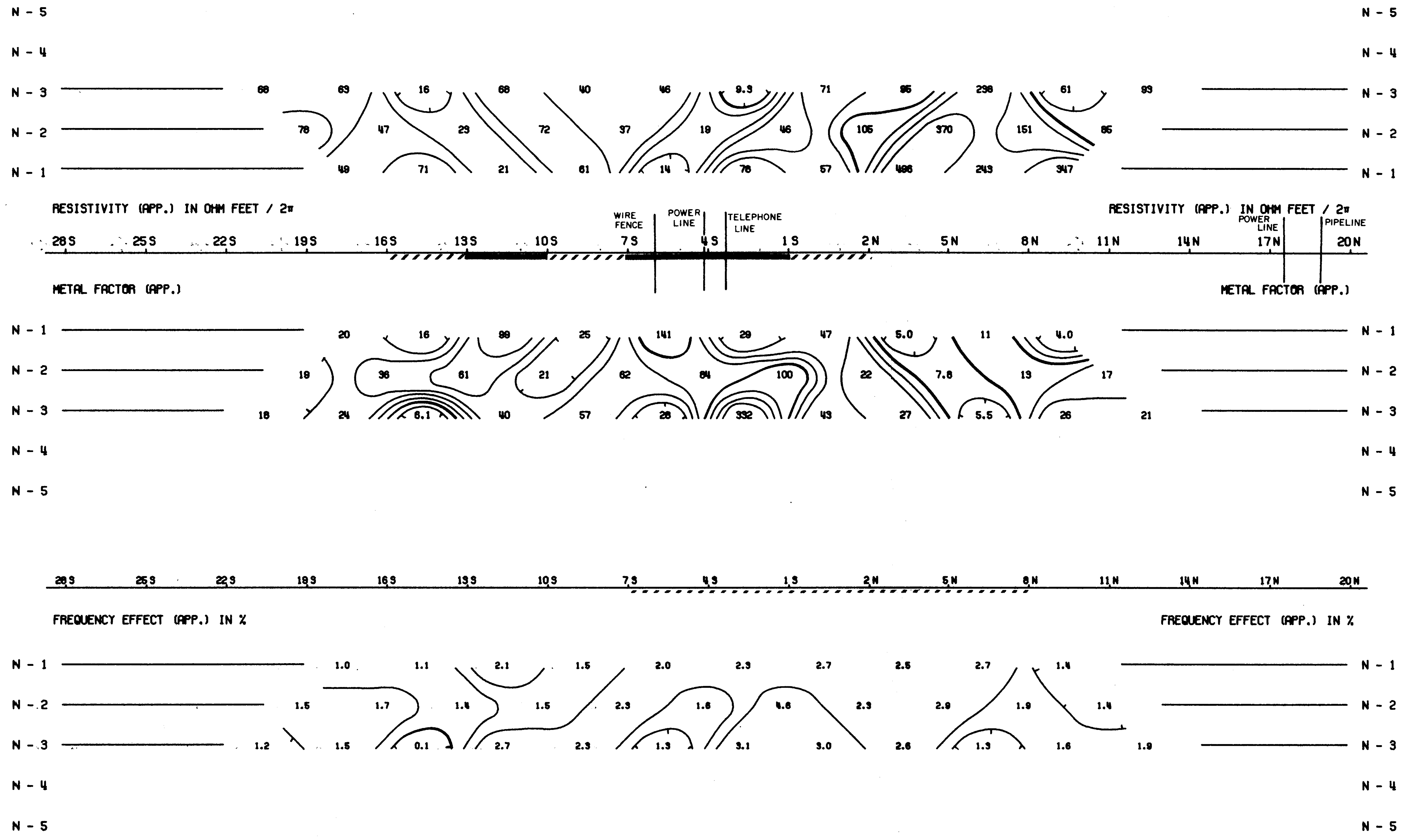
PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — PHILIP G. HALLOF

Expiry ... February 25, 1973

# McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION




DWG. NO.- I.P.-5976-28

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 10800E

ELECTRODE CONFIGURATION

PLOTTING POINT X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUL 1972

APPROVED:

DATE:

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — PHILIP G. HALLOF

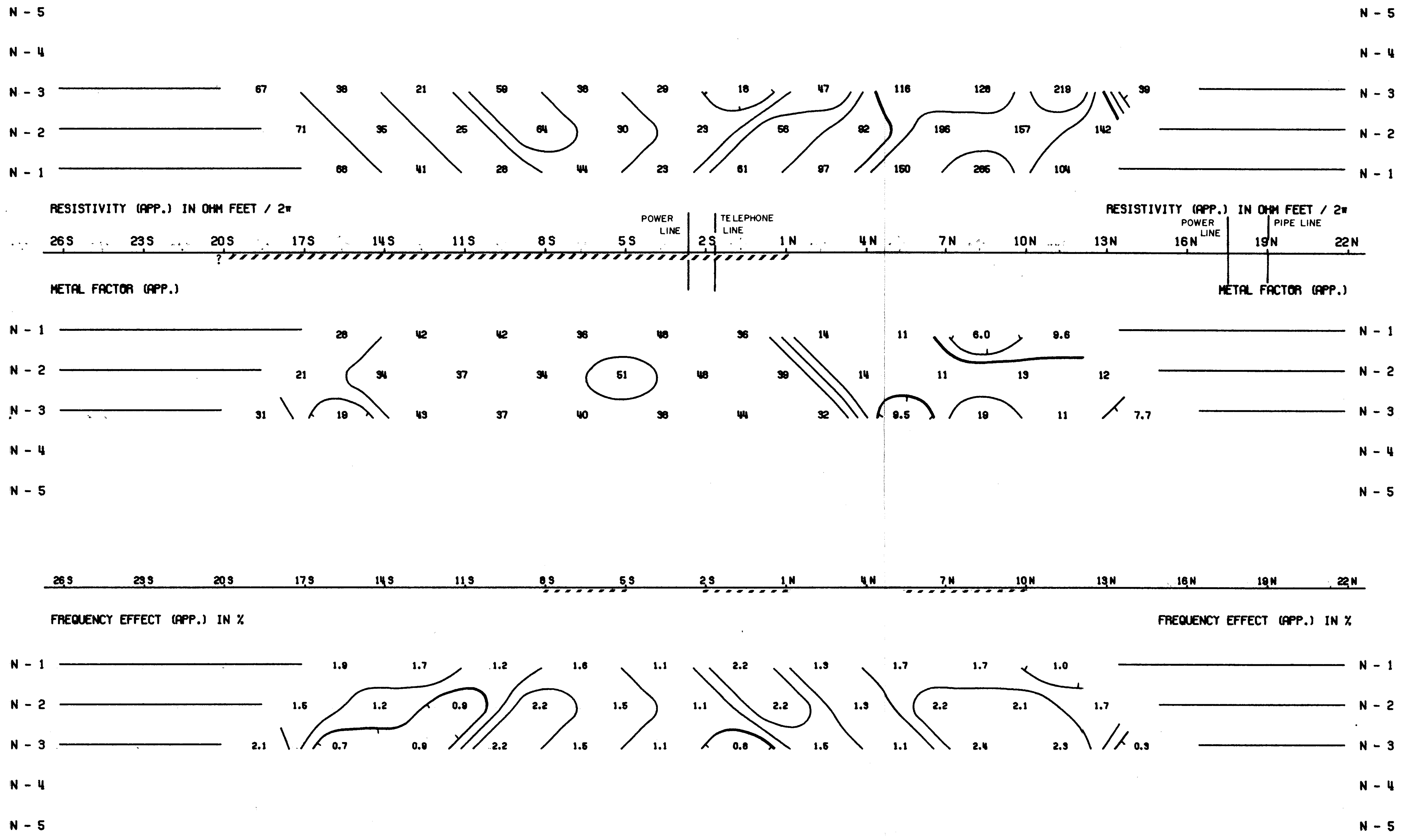
Expiry Date: February 25, 1973

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

## McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION




DWG. NO.- I.P.-5976-29

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 11200E

ELECTRODE CONFIGURATION

X — NX — X

PLOTTING POINT → X  X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUL 1972

APPROVED:

DATE:

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — PHILIP G. HALLOF

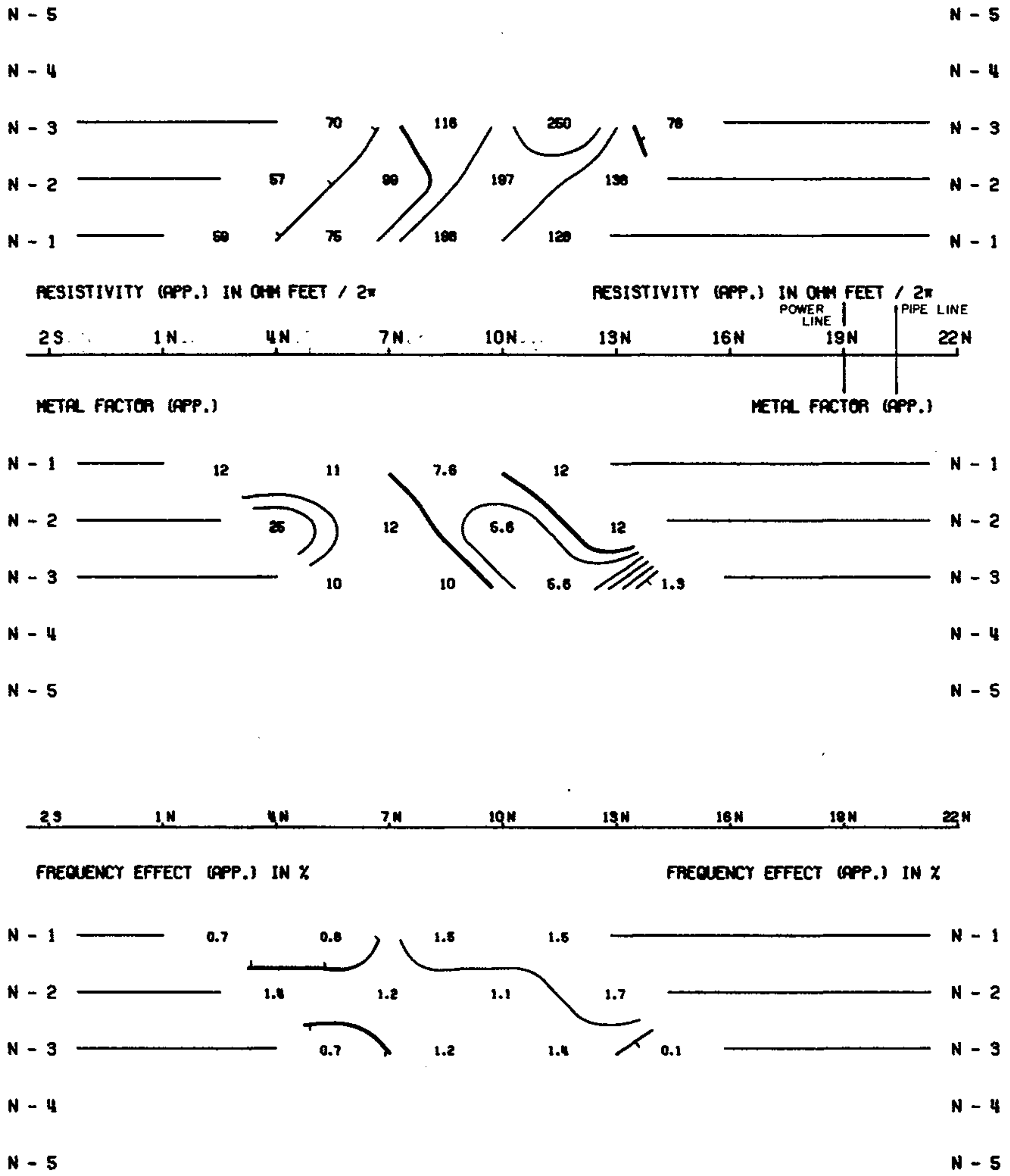
Expiry Date: February 25, 1973

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

# McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY McPHAR COMPUTER DIVISION



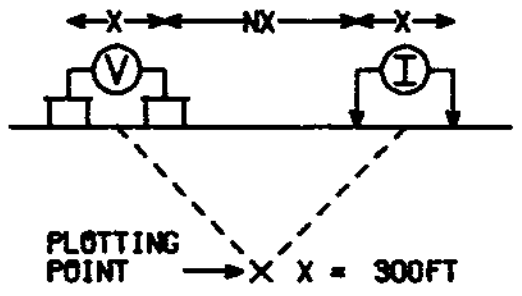

DWG. NO.- I.P.-5976-30

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA, KAMLOOPS M.D., B.C.

LINE NO.- 11600E

ELECTRODE CONFIGURATION




SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUL 1972

APPROVED:

DATE:

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — PHILIP G. HALLOF

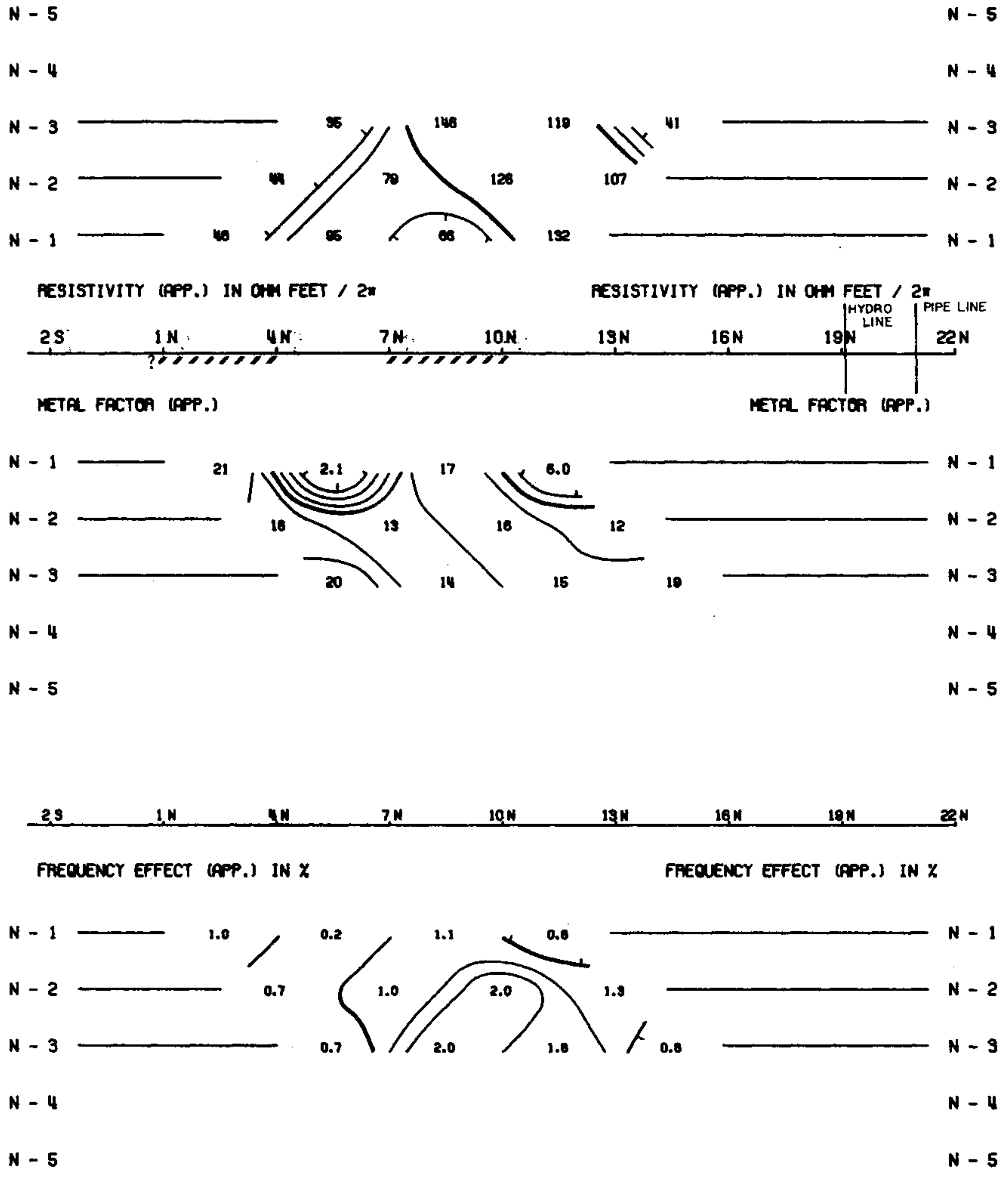
Expiry Date: February 25, 1973

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

# McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION




DWG. NO.- I.P.-5976-31

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA, KAMLOOPS M.D., B.C.

LINE NO.- 12000E

ELECTRODE CONFIGURATION

X NX X

PLOTTING POINT X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: 1972

APPROVED:

DATE:

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA PHILIP G. HALLOF

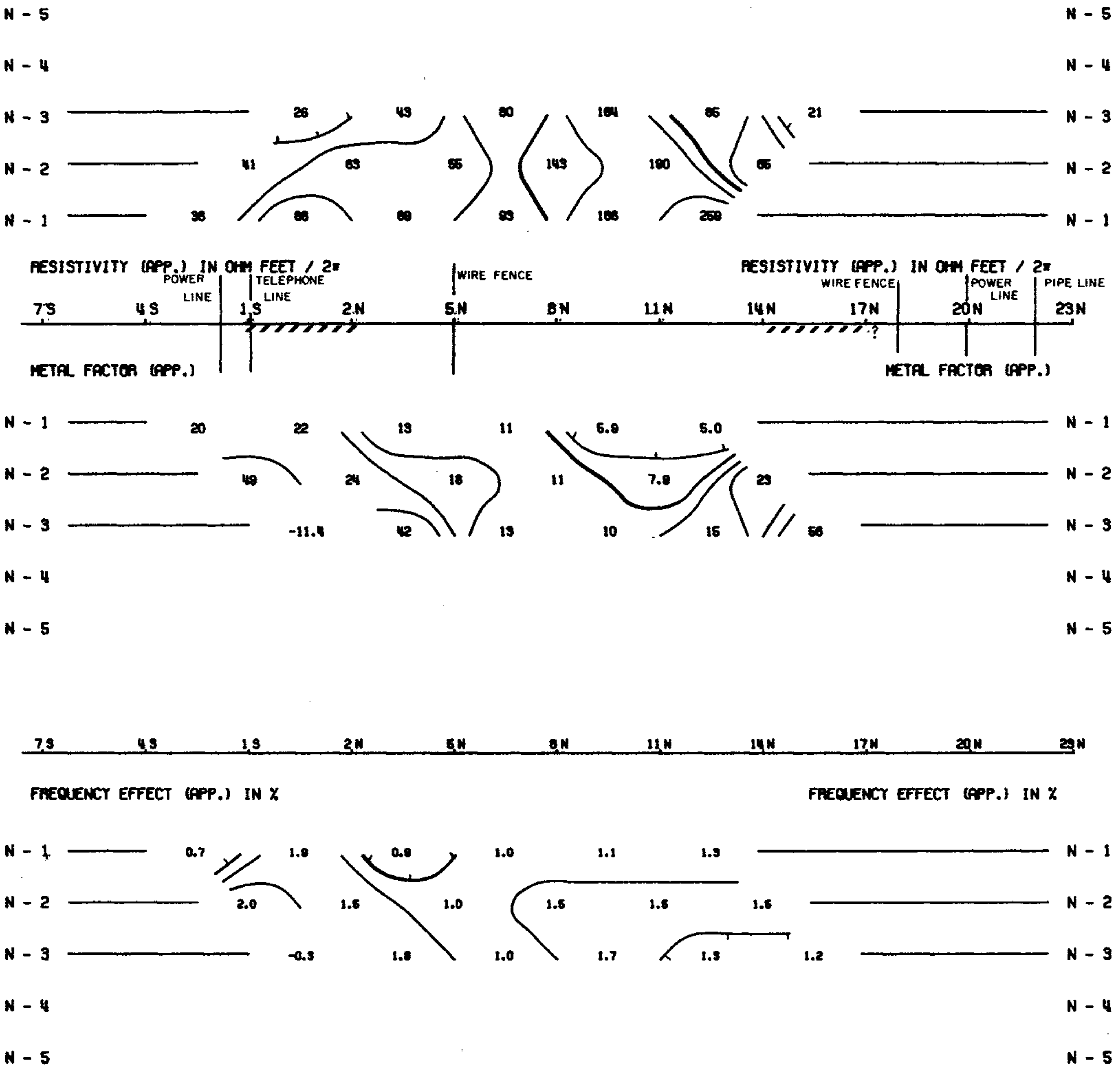
Expiry Date: February 25, 1973

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

# McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION




DWG. NO.- I.P.-5976-32

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 12400E

ELECTRODE CONFIGURATION

X NX X

PLOTTING POINT X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: ... 1972

APPROVED:

DATE:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

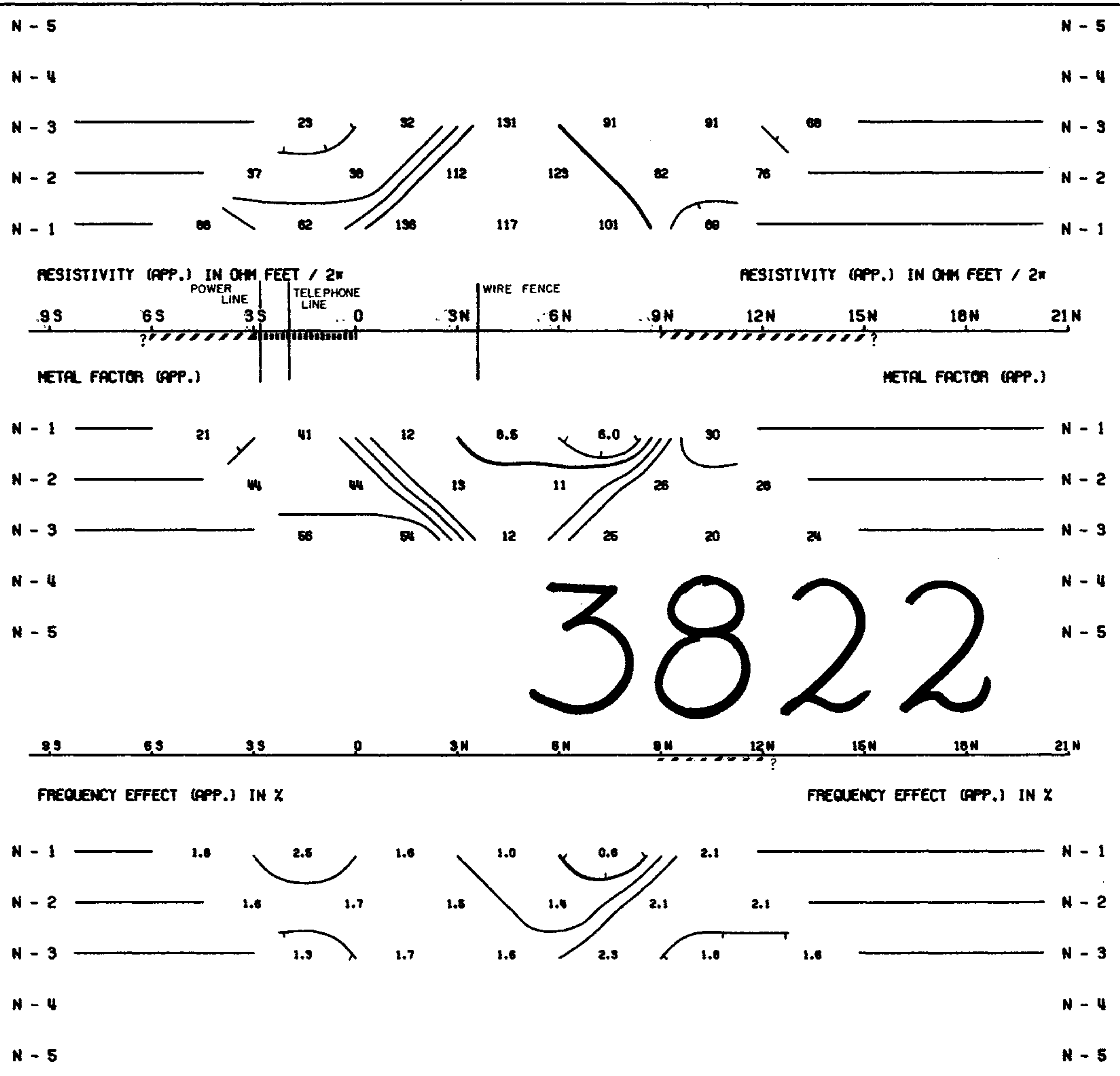
PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA PHILIP G. HALLOF

Expiry Date: February 25, 1973

# McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION




DWG. NO.- I.P.-5976-33

# TORWEST RESOURCES (1962) LTD., N.P.L.

BEV CLAIM GROUP, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 400E

ELECTRODE CONFIGURATION

PLOTTING POINT X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUL 1972

APPROVED:

DATE:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA

Expiry Date: February 25, 1973

# McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION

DWG. IPP-4855

# McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

PLAN MAP


SURFACE PROJECTION OF ANOMALOUS ZONES

| | (METAL FACTOR) | (FREQUENCY EFFECT) |
|---|---|---|
| DEFINITE | | |
| PROBABLE | | |
| POSSIBLE | | |

Number at the end of anomaly indicates electrode interval

## TORWEST RESOURCES (1962) LTD., N. P. L.

BEV CLAIM GROUP, CHERRY CREEK AREA

KAMLOOPS M.D., BRITISH COLUMBIA

SCALE

ONE INCH EQUALS FOUR HUNDRED FEET

ENDS OF IP ZONES

RESISTIVITY BOUNDARY

Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO 3822 MAP #1

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA PHILIP G. HALLOF

DWG. IPP- 4855