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SIERRA GEOPHYSICAL SERVICES, INC.
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Report

of

Induced-Polarization - Electrical Resistivity Survey Work

in the

Pyramid Lake Area, Washoe County, Nevada

June, 1976

INTRODUCTION

During the period June 13 to June 19, 1976, an induced-polarization-electrical resistivity gradient block survey was conducted in the Pyramid Lake Area, Washoe County, Nevada. In addition, a single expander-profile was placed across the principal chargeability anomaly detected by the gradient survey.

For the gradient survey two fixed current electrodes were places 13,015 feet apart, in the positions shown on Figure 1, the profile location map. The survey profiles were then run between them, maintaining a parallel relationship with the line joining the electrode points. As shown on Figure 1, the profiles were 2000 feet apart. The receiver dipole length for all readings was 1000 feet. Total profile length for the survey was 44,000 feet, obtained in about 3½ measurement days. The contoured results of this gradient survey are presented as Figures 2 (Apparent Chargeability) and 3 (Apparent Resistivity).

The lone expander-profile was run upon completion of the gradient survey. Owing to the ruggedness of the area and the need to limit survey time, the current electrode array was placed on the road running along the main valley. The center of the current electrode spread was positioned so as to overlay the principal anomalous feature where it crosses the valley road. The position of the electrode array is shown in Figure 1. Only current electrode positions are shown to avoid cluttering the map. Reference will be given to these electrode positions in describing the electrical features of the plot. The array for the expander-profile was dipole-dipole, with dipole length of 500 feet, and n from 1 to 6. The plot of these data is Figure 4.

DISCUSSION

Gradient Survey - Figures 2, 3

One principal chargeability feature was detected and outlined in the gradient block survey. This is shown in Figure 2 as a linear chargeability high which projects into the survey block from the east-northeast. The apparent breadth of the zone is on the order of 1500 to 3000 feet. The actual width of the zone may be as much as 50 percent less; the gradient block results tend to amplify lateral dimensions. The strike length into the block is at least 5000 feet. The termination of the western end of the zone is roughly defined in the interval between Profiles 0 and 1 West. However, the trace of the zone may actually extend west of Profile 1 West.

Of principal interest along the responsive zone is that part exhibiting the highest amplitude, across Profiles 1 East and 2 East. From experience with gradient block data the values of 32.8 and 33.8 milliseconds at the highest level of the anomaly may be as much as 50 percent lower than the true chargeability value of the responsive material.

Although the chargeability anomaly is not a closed bullseye, as one might wish, the linear zone does represent a major mineralization feature. The proximity of the western nose of the responsive zone to adits and other workings might suggest an untested center for the associated contiguous, possibly shallower features previously investigated.

The resistivity map, Figure 3, shows a strong resistivity gradient in a north-northeast direction. The southern end of the survey block is highly resistive, whereas the northern end, toward the valley and beyond, shows a much lower resistivity level. The reason for this is not readily apparent.

In general, the resistivity results are far more subject to being altered by terrain effects than the chargeability results. In the former, local highs and lows can be fictitiously produced in rugged terrain. Nevertheless, owing to the steep (and real) resistivity gradient to the northeast, these affects are not readily observed. It is apparent that in the gradient results there is no distinctive resistivity low associated with the chargeability feature. A resistivity "bench" is observed to overlap the chargeability feature in part. If the local resistivity gradient were removed, this "bench" would represent a moderate resistivity high for the general chargeability feature.

Expander-Profile - Figure 4

The expander-profile was centered across the road-ward extension of the gradient chargeability anomaly. The plot of this profile, Figure 4, shows the responsive material well. In fact, both boundaries of the feature are identified within the effective coverage of the total electrode spread. The responsive material has definite shallow depth expression between current electrode positions 4 and 6. In all probability the western boundary of the zone extends at a deeper level to a position directly beneath current electrode position 3. This gives a general width range of about 750 to 1300 feet. The general depth to the top of the feature is approximately 1000 feet, although shallower extensions of responsive mineralization may exist. The maximum value reached was 45.1 milli-seconds which represents a fraction of the true chargeability. From experience, the true chargeability is probably on the order of 60 milliseconds, which might represent, using a rule of thumb, about 2 to 3 volume percent of pyrite mineral-ization.

The resistivity data indicate that a low resistivity is associated with the chargeability zone. However, the resistivity contrast with surrounding materials is small. (Generally higher resistivities surrounding this low have predominated the gradient results in this vicinity.) The probable continuation of the lower resistivity zone is shown on Figure 4. Noted in passing is a higher resistivity lying about 2000 feet east of electrode 7. The effects of this zone, back into the data, disrupt the eastern side of the lower resistivity pattern.

One final comment should be made. The chargeability anomaly as it appears on the expander-profile may in part be side-looking into a more responsive main zone, such as the locality immediately southwest, represented by higher gradient chargeability values. (The greater than 40 millisecond values observed on the expander-profile may actually reflect this.) If an expander-profile were to be run directly over the latter area, higher chargeability values would probably result. These values would be closer to the true chargeability of the responsive material.

SUMMARY AND RECOMMENDATIONS

The net result of the gradient survey was to define the general position of a large anomalous chargeability feature. As expected, the check with expander-profile of this feature was positive, with informative detail added by the expander-profile.

The gradient survey process for obtaining the data in this rugged area was very effective, giving the best amount of reliable coverage in the time available. The limits of the broad response feature were determined with reasonable certainty. We feel confident that responsively bland portions of the gradient profiles would be generally bland on overlapping expander-profiles. Small features which may be significant were sacrificed, but in the light of the larger principal response feature, future geologic or geophysical reconnaissance for such should be aided. At some time it might be desired to further define the best portion of the linear chargeability zone, or to obtain detail on other portions of the zone. This could be done either with expander-profiles or with smaller gradient blocks.

SIERRA GEOPHYSICAL SERVICES, INC.

W. P. Knox

W. Patrick Knox
Senior Geophysicist

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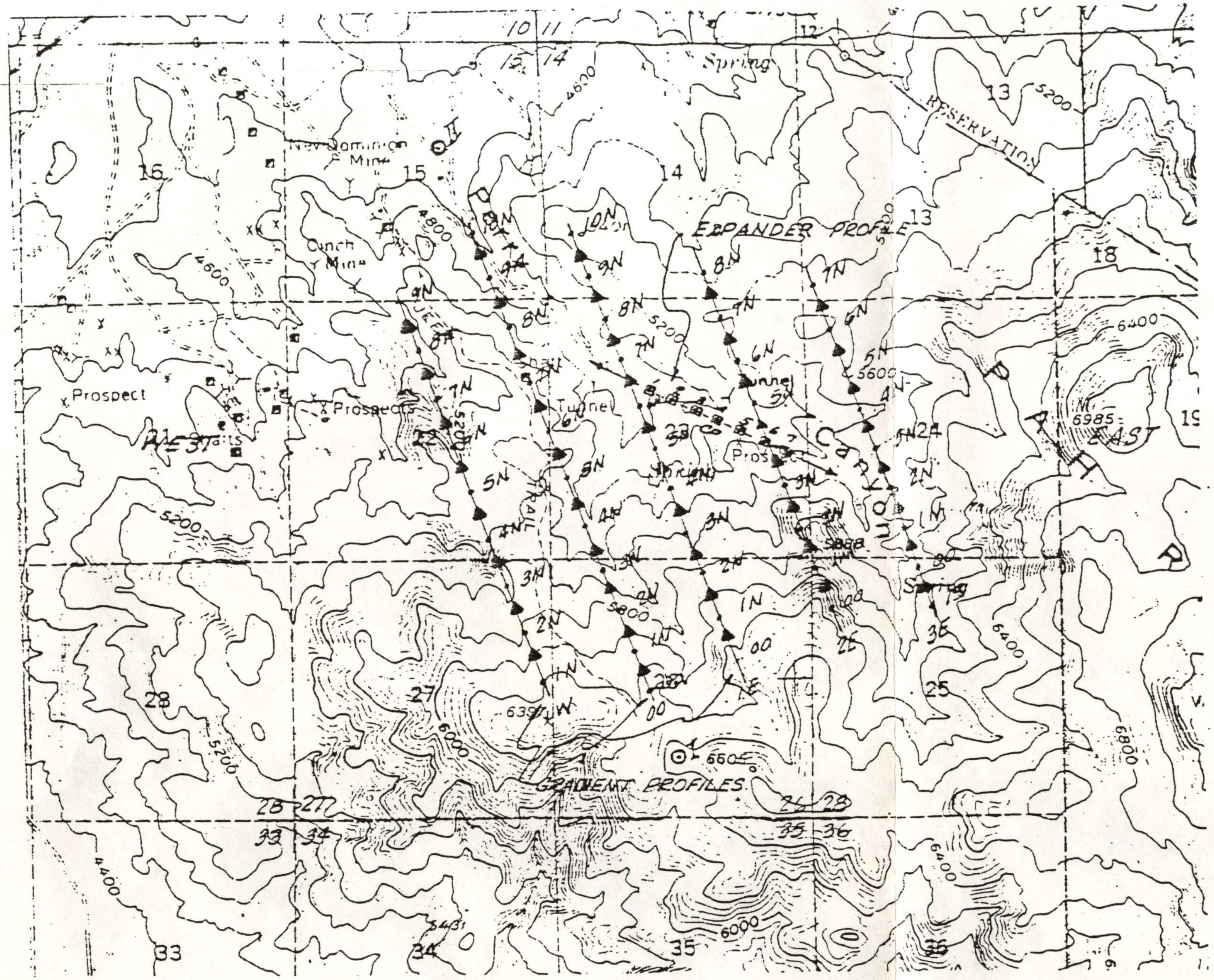
FIGURE I



Legend

Gradient

⊙ Current electrode

▲ Plot point

• Receiver electrode

Expander profile

⊡ Electrode point

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INDUCED POLARIZATION-ELECTRICAL RESISTIVITY

PLAN LAYOUT OF GRADIENT PROFILES AND EXPANDER PROFILE

PYRAMID LAKE AREA FOR ATLANTIC RICHFIELD CORP.

county: WASHOE	map no.: PP-1-A
state: NEVADA	data by: R.D.C.
AMS sheet: RENO	drawn by: P. B.
township-range: T23N, R21E.	survey period: 6/13 – 6/19, 1976

0 — ½ mile — 1 mile

Fig. 2

Pyramid Area, Nevada

Geology and Alteration Zonation Map

0 2000' 4000'

Explanation

Post mineral basalt

Hartford Hill Rhyolite

1 Propylitic: Chlorite replacing ferromagnesian minerals. Epidote & sericite replacing feldspars.

2 Pervasive quartz - sericite.

— — — ARCO claim boundary

3 Pervasive quart - kaolinite, with local sericite (Sippled). Found as large vein selvages.

4 Pervasive quart - diaspore, with local sericte (stippled)

5 Pervasive quart - kaolinite - pyrophyllite.

Major quartz - baite - pyrite - enargite veins

Mine shaft

Adit

119° 35'

FIGURE 2

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Apparent Chargeability Values
M_a, in ms. (5 ms contour interval)

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INDUCED POLARIZATION-ELECTRICAL RESISTIVITY GRADIENT SURVEY

PYRAMID LAKE AREA FOR ATLANTIC RICHFIELD CORP.

county WASHOE	map no. PG-1-A
state NEVADA	data by R.D.C.
AMS sheet RENO	drawn by P.B.
township-range T.23N, R.21E.	survey period 6/13 – 6/19, 1976

FIGURE 2

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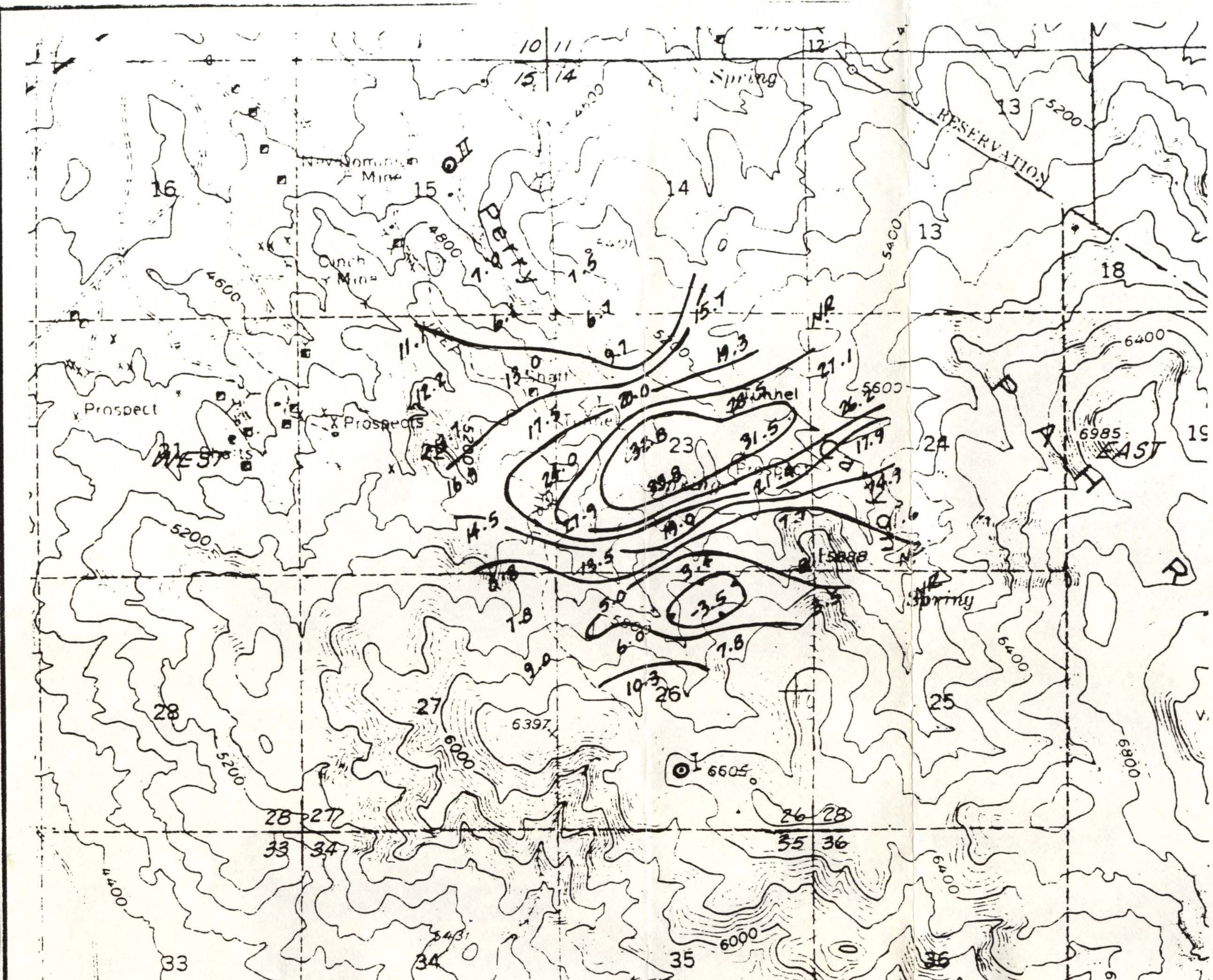

Apparent Chargeability Values

M_a, in ms. (5 ms contour interval)

SIERRA GEOPHYSICAL SERVICES, INC.

INDUCED POLARIZATION-ELECTRICAL RESISTIVITY GRADIENT SURVEY

PYRAMID LAKE AREA FOR ATLANTIC RICHFIELD CORP.

county: WASHOE	map no. PG-1-A
state: NEVADA	data by: R.D.C.
AMS sheet: RENO	drawn by: P.B.
township-range: T. 23N, R. 21E.	survey period: 6/13 - 6/19, 1976

0 ½ mile 1 mile

Scale 1 in = 2640 ft.

FIGURE 3

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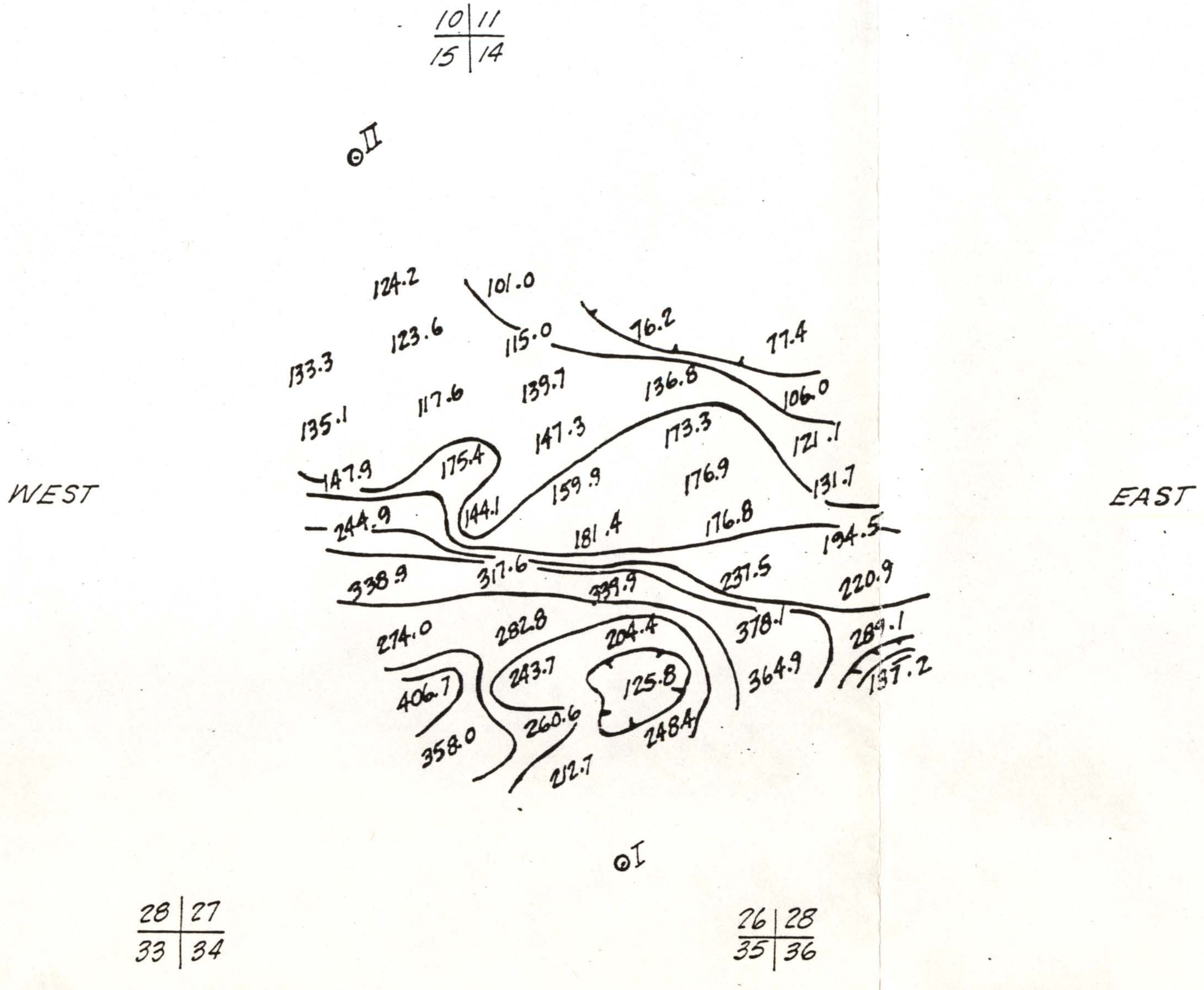

Apparent Resistivity Values

ρ_a in ohm-meters - log contour interval

SIERRA GEOPHYSICAL SERVICES, INC.

INDUCED POLARIZATION –

ELECTRICAL RESISTIVITY

GRADIENT SURVEY

PYRAMID LAKE AREA FOR ATLANTIC RICHFIELD CORP.

county	WASHOE	map no.	PG-2-A
state	NEVADA	data by	R.D.C.
AMS sheet	RENO	drawn by	P.B.
township-range	T.23N, R.21E.	survey period	6/13 – 6/19, 1976

0 ½ mile 1 mile

Scale 1in = 2640 ft.

FIGURE 3

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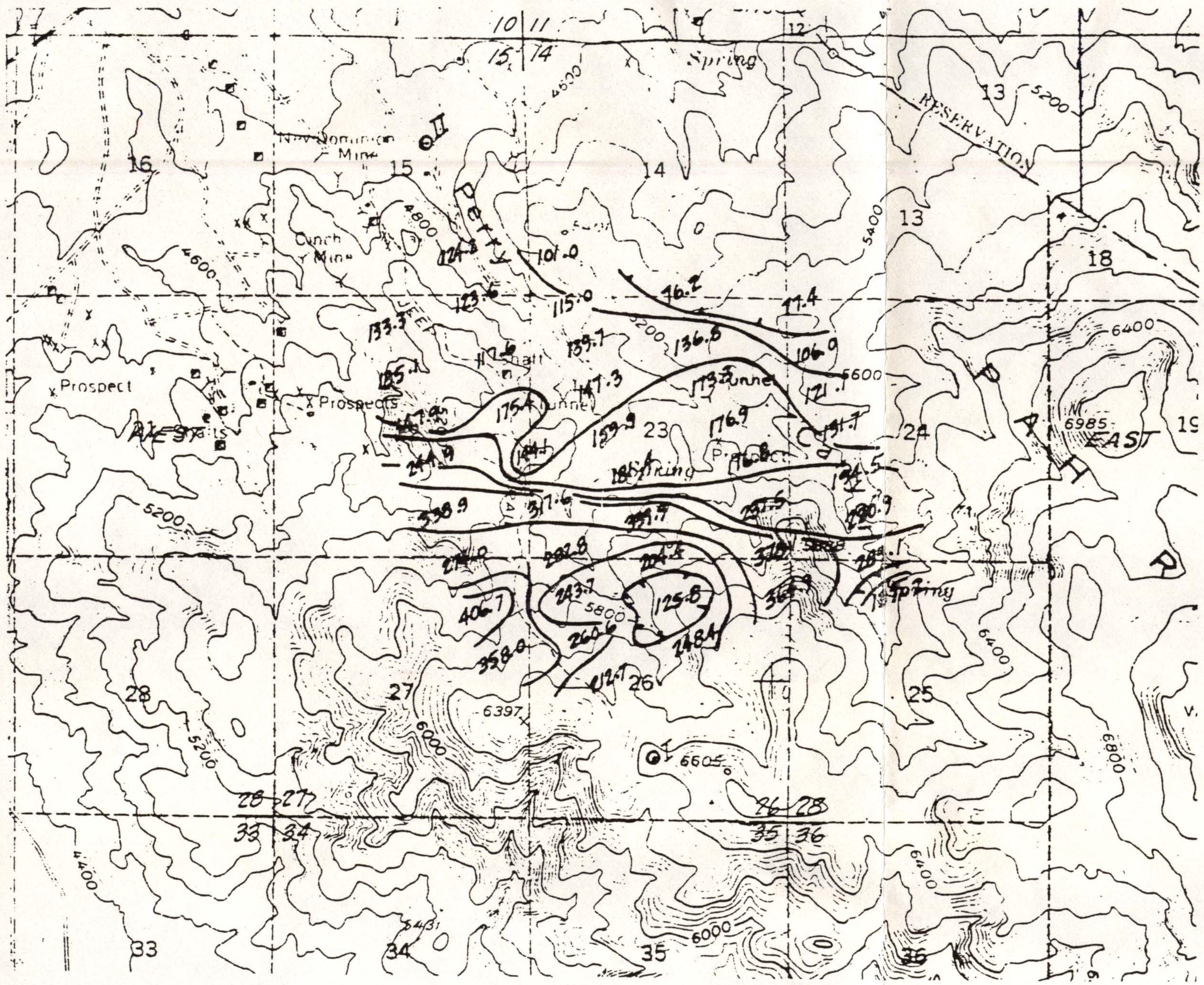

Apparent Resistivity Values

ρ_a in ohm-meters - log contour interval

SIERRA GEOPHYSICAL SERVICES, INC.

INDUCED POLARIZATION -

ELECTRICAL RESISTIVITY

GRADIENT SURVEY

PYRAMID LAKE AREA FOR ATLANTIC RICHFIELD CORP.

county WASHOE	map no. PG-2-A
state NEVADA	data by R.D.C.
AMS sheet RENO	drawn by P.B.
township-range T.23N, R.21E.	survey period 6/13 - 6/19, 1976

0 ½ mile 1 mile

Scale 1in = 2640 ft.

FIGURE 4

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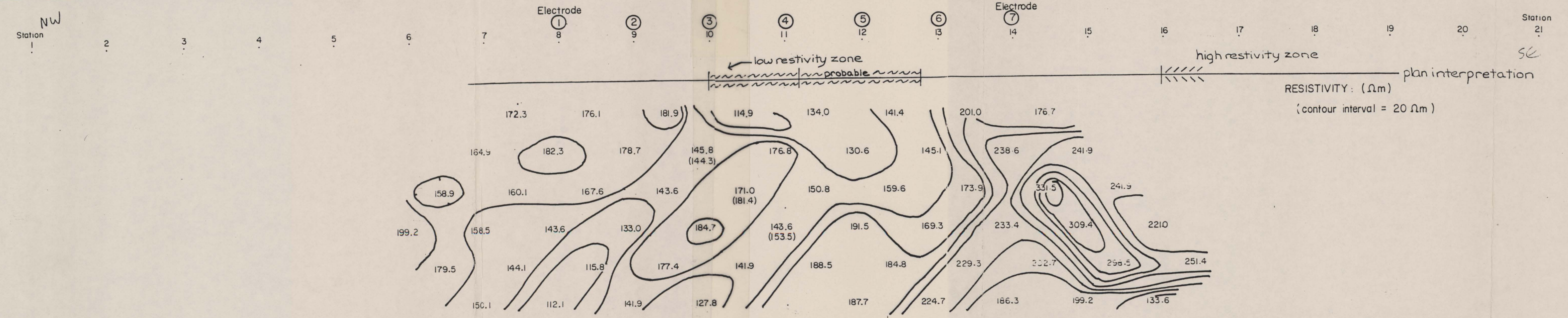

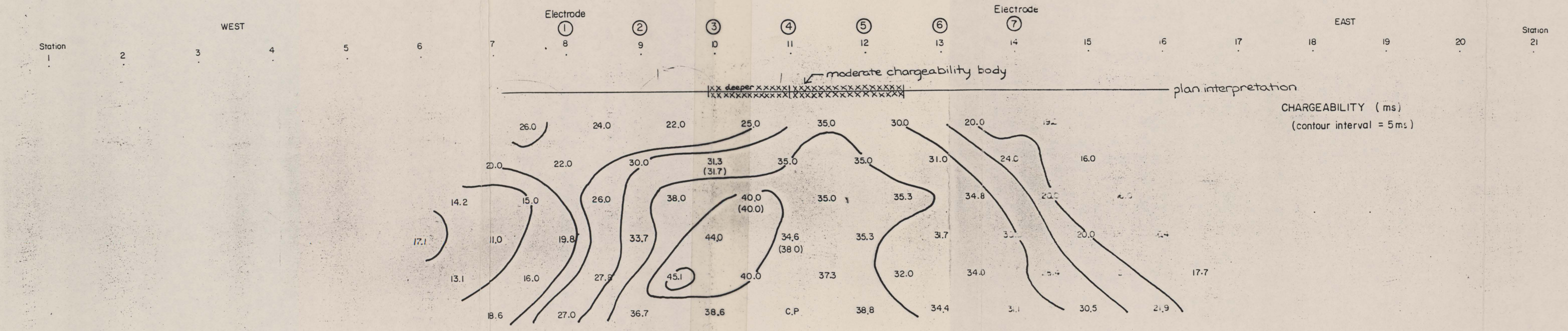

SIERRA GEOPHYSICAL SERVICES, INC.

INDUCED POLARIZATION - ELECTRICAL RESISTIVITY EXPANDER PROFILE

PYRAMID LAKE AREA FOR ATLANTIC RICHFIELD CORP.

county WASHOE	map no. PxP-1-A
state NEVADA	data by R. D. C.
A.M.S. sheet RENO	drawn by Phil
township-range T 23 N, R 21 E	survey period 6/13 - 6/19/76

scale 1 in = 500 ft (0, 500, 1000, 1500, 2000)

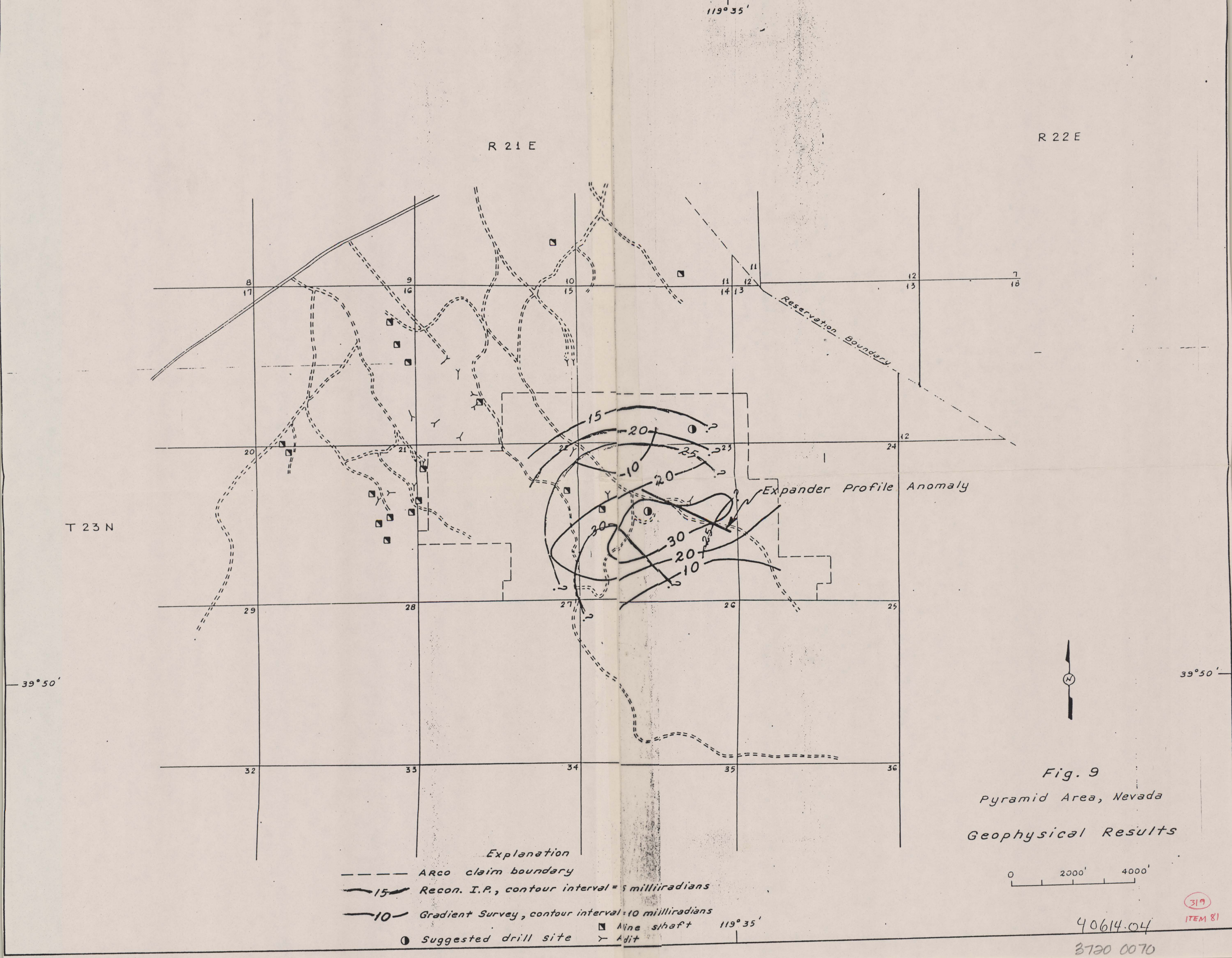

Fig. 9

Pyramid Area, Nevada

Geophysical Results