COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD No. 1963/101

TINDALL AIRSTRIP GEOPHYSICAL SURVEY.

NORTHERN TERRITORY 1962

by

J. DALY

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SUMMARY

A test survey using the potential-ratio method was made on, and near, the Tindall airstrip to test the value of the results in detecting subsurface caves which might affect the serviceability of the airstrip. A well-defined zone having anomalous electrical properties was located. It is recommended that this zone be tested by drilling, to see whether the anomalous electrical properties can be correlated with suitability for airstrip construction.

1. INTRODUCTION

Tindall airstrip is about 12 miles south-east of Katherine, NT, in close proximity to Venn airstrip. Both strips are underlain by limestone. In connexion with proposals for reconditioning an airstrip in the neighbourhood, it was thought that the limestone might contain solution cavities, which would adversely affect the serviceability of the strips. At the request of the Department of Works, the geophysical staff of the Darwin office of the Bureau of Mineral Resources, Geology and Geophysics, made surveys to test the applicability of the potential-ratio method to the problem of detecting cavities. The results of tests at Venn airstrip have been described by Daly (1962). This Record describes the results of two traverses using the potential-ratio method at Tindall airstrip. The survey was made in August 1962 by geophysicist F. Maranzana.

2. TECHNICAL DETAILS

The potential-ratio method involves investigation of the distribution, in the ground, of potential due to a current supplied in principle to a single electrode. In practice, an alternating current is supplied between a near electrode and another electrode at a considerable distance. The measuring system consists of three electrodes and a bridge that measures the potential-ratio and phase difference between consecutive pairs of electrodes. This method was chosen as it is known to be an extremely sensitive method of investigating the electrical properties of the ground close to the surface.

Experience with the potential-ratio method at Venn had shown it was more satisfactory to use non-polarising electrodes such as are used on self-potential surveys. These were placed in shallow depressions, which were lightly watered about 10 minutes prior to taking the readings.

Geological conditions at Tindall are generally similar to conditions at Venn, except that the soil cover at Tindall appears to be considerably thinner. The surface at Venn airstrip is entirely soil covered and there is no outcrop close to the strip. Limestone crops out in close proximity to Tindall, and it is reasonable to suppose that it is present at shallow depth under the strip. In some places the thickness of soil cover may be very small.

The layout of the traverses is shown in Plate 1.

3. RESULTS AND INTERPRETATION

The results are shown in Plates 2 and 3 as profiles of logarithm of potential gradient and profiles of phase. In connexion with the potential-gradient profiles, the following points must be borne in mind:

(a) the usual geometrical corrections have not been applied to readings between Stations 9300 and 11,100 on each profile. The effect of these corrections on individual readings is very small but the systematic omission of them over a considerable length of the profile causes a steady increase in the level of potential gradient. This feature appears on both profiles, but has no relation to actual geological conditions,

(b) between Stations 8500 and 9500 on Traverse 00, readings were taken only at every second observation point. For the calculation of potential gradient, readings at each point are required. The values at the intermediate points have been inserted by linear interpretation between adjacent readings. However, these values only serve the purpose of connecting the portions at the beginning and end of the traverse, and no indication appearing in this part of the potential-gradient profile can be relied on.

A feature of conditions at Tindall airstrip is the generally high ground-conductivity, as compared with Venn airstrip. It is generally found that potential-ratio surveys cannot be taken farther than 1500 ft from the current electrode, owing to loss of signal. At Tindall airstrip, traverses 3000 ft long were read without difficulty.

From the results obtained at Venn airstrip, Daly (1962) concluded that anomalous zones were clearly defined by the phase readings, either as areas over which the phase was consistently positive, or in which phase readings were unobtainable due to extreme out-of-phase conditions. The potential-gradient results were different over different areas. At Venn airstrip itself, the gradient profiles showed strong anomalies, definitely correlated with the anomalous zones as defined by the phase readings. At other areas in the neighbourhood, the gradient profiles were irregular, and anomalies could not be correlated with the phase anomalies. It was concluded that the nature of the gradient profiles was critically dependent on surface soil conditions.

The results obtained at Tindall airstrip are similar to those obtained at Venn, in that the phase profiles show definite anomalous zones and are otherwise quite undisturbed. However, the gradient profiles are irregular, and show no useful anomalies. It is considered that this is due to the small thickness of soil cover at Tindall.

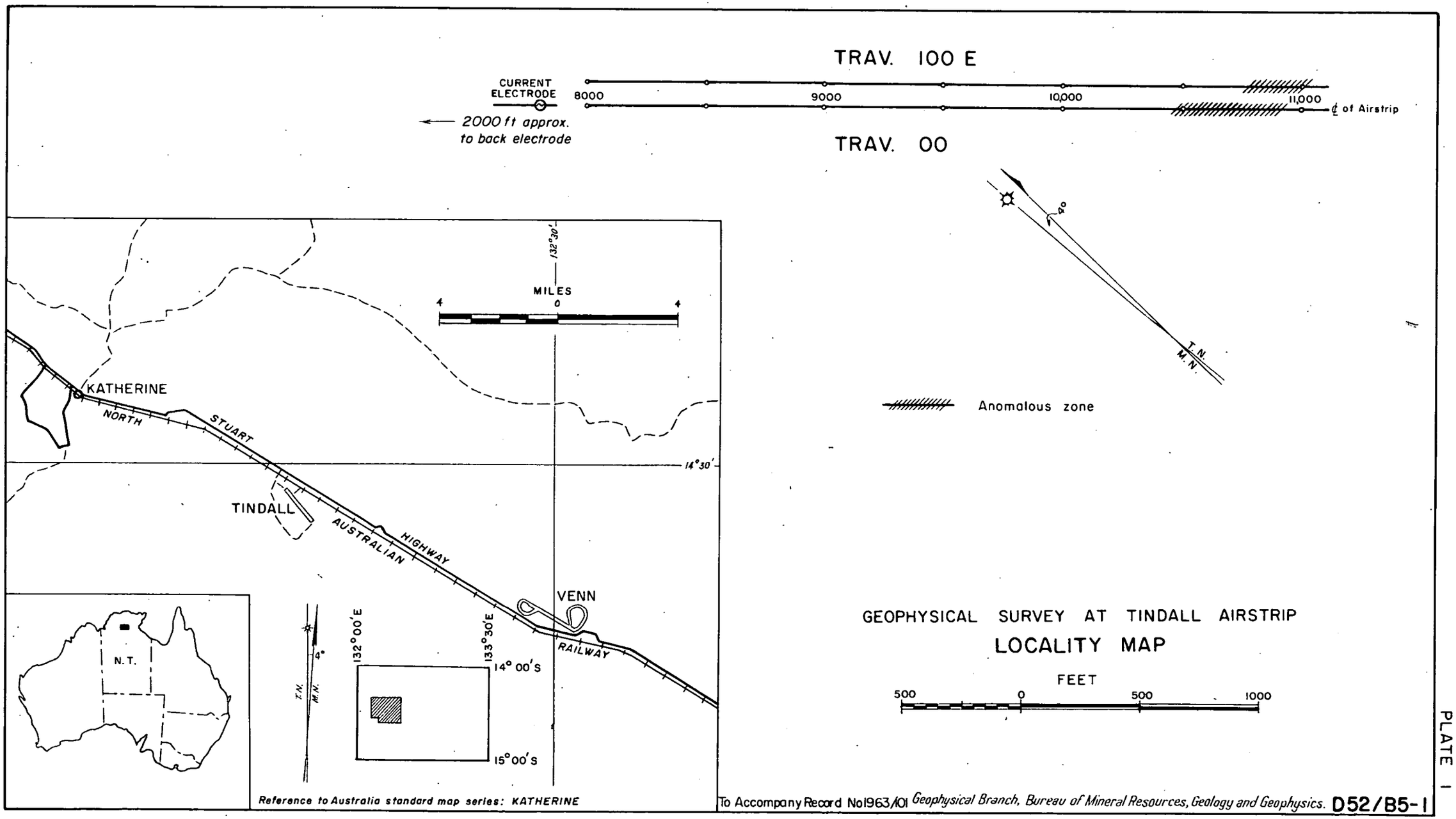
4. CONCLUSIONS

The survey indicated an anomalous zone, which appears on both traverses and is similar electrically to anomalous zones located at Venn airstrip. It is recommended that this zone be tested by drilling, to see if its anomalous electrical character can be correlated with suitability for airstrip construction.

5. REFERENCE

DALY, J. 1962 Venn airstrip geophysical survey, NT 1962. Bur. Min. Resour. Aust. Rec. 1962/04 (unpubl.)

ENGINEERING



GEOPHYSICAL SURVEY AT TINDALL AIRSTRIP
LOCALITY MAP

FEET

500 0 500 1000

PLATE 1

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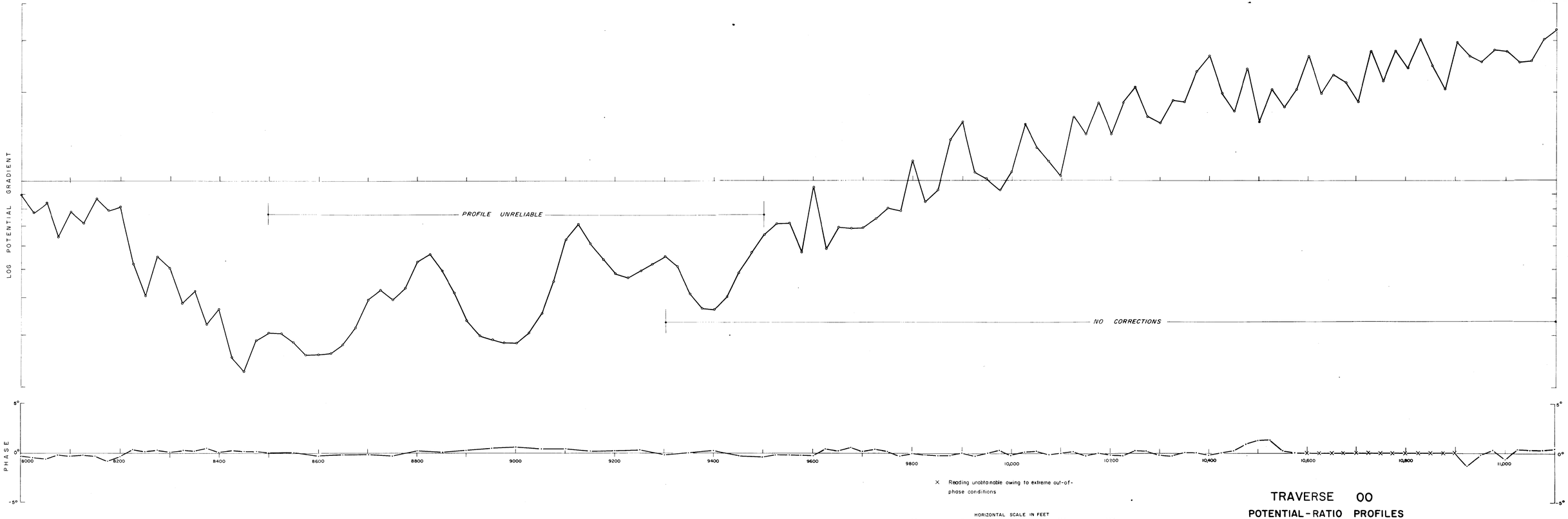
PLATE 2



TRAVERSE 00
POTENTIAL-RATIO PROFILES

FREQUENCY 440 c/s

TINDALL AIRSTRIP, N.T. 1962.

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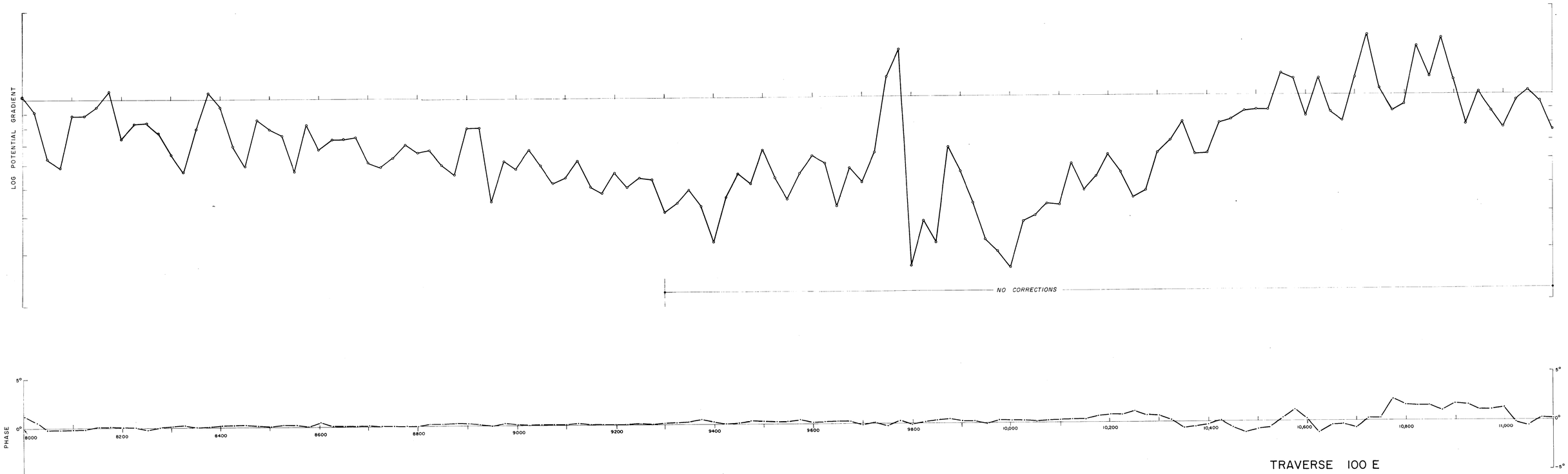
PLATE 3



TRAVERSE 100 E

POTENTIAL - RATIO PROFILES

FREQUENCY 440 c/s

HORIZONTAL SCALE IN FEET

100 0 100 200 300

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TIMMALL AIRSTRIP, N.T. 1962.